Available online at http://inakidneyhypertension.co.id Official Journal of the Indonesian Society of Nephrology
Indonesian Journal of Kidney & Hypertension InaKidney

Case Report

Mechanical and Technical Complication in Patient with Continuous Ambulatory Peritoneal Dialysis (CAPD) with Encapsulated Peritoneal Sclerosis

Theodore Dharma Tedjamartono[1], Yenny Kandarini[2], Gede Wira Mahadita[2]

[1]Department of Internal Medicine, Faculty of Medicine, Universitas Udayana/Prof. Ngoerah Hospital, Denpasar, Indonesia
[2]Division of Nephrology and Hypertension, Department of Internal Medicine, Faculty of Medicine, Universitas Udayana/Prof. Ngoerah Hospital, Denpasar, Indonesia

ARTICLE INFO

Article history:
Received: June 30, 2025
Accepted: December 19, 2025
Published Online: December 24, 2025

Corresponding Author:
Theodore Dharma Tedjamartono, Department of Internal Medicine, Faculty of Medicine, Universitas Udayana/Prof. Ngoerah Hospital, Denpasar, Indonesia, theodoredharma@yahoo.com

ABSTRACT

Continuous Ambulatory Peritoneal Dialysis (CAPD) relies on an intraperitoneal catheter for the inflow and outflow of dialysate fluid; therefore, mechanical complications are often encountered. Encapsulated peritoneal sclerosis (EPS) is one of the rare complications in CAPD patients, but it has high mortality and morbidity rates. A case of a patient with EPS was reported in a 53-year-old man in the form of a problem with the dwelling of the CAPD. Patients complain of a longer duration of dwelling with a positive fluid balance. There are no complaints of fever or abdominal pain. Abdominal inspection shows symmetrical, no mass, no wound or pus from the CAPD tip. The patient had a history of recurrent peritonitis. CAPD Cuff was released due to laparoscopy findings with grade IV adhesions in the omentum and peritoneum; it also showed omental cakes and peritoneal fluid with debris. Diagnosis of EPS was established based on the presence of clinical symptoms due to intestinal obstruction and structural disorders due to peritoneal fibrosis, like thickening and adhesions of the intra-abdomen, accompanied by findings of fibrous cocoon or omental cakes in the intestine, with laparotomy and/or laparoscopy. CAPD is related to various complications of infections and non-infections. Although complications related to infections are more often found, non-infection complications such as EPS can also occur in CAPD Patients; therefore, clinicians need to be aware of this complication, especially in patients with a history of recurrent peritonitis.

Keywords: CAPD, Hemodialysis, Mechanical Complication, Encapsulated Peritoneal Sclerosis.

Introduction

Indonesia's geographical conditions in the form of islands, with limitations in transportation facilities resulting in patients' difficulty in reaching the hemodialysis (HD) unit routinely, thus, Continuous Ambulatory Peritoneal Dialysis (CAPD) can be considered as a first choice of renal replacement therapy in patients with End-Stage Renal Disease (ESRD).[1,2] The advantages of using CAPD include maintaining Residual Kidney Function (RKF), increasing patient independence, and reducing costs compared to HD. However, the inability to maintain patients on CAPD for the long term is one of the challenges of a Nephrologist.[2,3] CAPD is associated with various infectious and non-infectious complications. Infection is a common complication in CAPD patients.[1] Peritonitis is the main cause of technical complication of Peritoneal Dialysis and is one of

Cite this as:
Tedjamartono TD, Kandarini Y, Mahadita GW et al. Successful Management of Thyroid Storm with Continuous Renal Replacement Therapy without Plasma Exchange. InaKidney. 2025;2(2);145-150. doi: 10.32867/inakidney.v2i2.195

the most serious complications of CAPD. Although the mortality rate from peritonitis is less than 5%, severe and prolonged peritonitis will cause damage to the structure and function of the peritoneal membrane, which will lead to membrane failure.[2] While non-infectious complications include catheter-related complications, dialysis processes, and metabolic complications. Complications can also be related to increased intra-abdominal pressure and problems related to membrane dysfunction.[4]

Peritoneal dialysis relies on an intraperitoneal catheter for the inflow and outflow of dialysate fluid, so mechanical complications are common. Several studies have shown that around 40% of patients experience mechanical complications that cause a conversion rate to HD of up to 20%.[5] Encapsulated peritoneal sclerosis (EPS) is a rare complication in CAPD patients, but it has high mortality and morbidity rates.[6] The reported mortality is around 50% within one year of diagnosis. Estimates of the prevalence of EPS vary from 0.4% to 8.9%.[4] The duration of CAPD is one of the factors that increases the incidence of EPS. The prevalence of EPS increases from 2-3% in the first 5 years of DP to 6-20% after patients have undergone DP for 10 years.[1,2]

The pathogenesis of EPS is still unknown; it is suspected that fibrin deposition in the peritoneum causes the formation of a dense capsule that can wrap the small intestine, causing obstruction. The main risk factor for EPS is the duration of PD, with a higher incidence after more than five years, especially in patients with recurrent severe peritonitis.[6] The diagnosis of EPS is characterized by clinical symptoms that resemble intestinal obstruction such as weight loss or malnutrition (with or without systemic inflammation) and can be confirmed by radiological imaging (CT scan) or the presence of fibrous tissue thickening during laparotomy.[4]

This report will explain one of the non-infectious complications in patients with CAPD, namely Encapsulated Peritoneal Dialysis, with the aim of increasing clinician awareness of this condition.

Case Illustration

A 53-year-old male patient came with a chief complaint of dwelling abnormalities. The complaint was first felt about 4 days before entering the hospital. Initially, the patient said the dwelling duration was longer than usual. The patient dwelt 4 times a day; each dwelling session was said to generally last 4 hours, but over the last 4 days, it was said to last more than 6 hours. The patient said that in the last 4 days, the dwelling duration was longer with a fluid balance that was still negative, but since the day before, the patient's fluid balance was said to be positive. The last patient had a dwell time of 1700 ml of fluid in and 1400 ml of fluid out. CAPD fluid was said to be initially still clear. Other complaints, such as abdominal pain, were denied; there were no complaints of fever, nausea, or vomiting. The patient had a history of hypertension since 2019, but did not receive regular treatment. In 2020, the patient underwent HD for the first time with AV Shunt access. In early 2021, the patient agreed to do Peritoneal Dialysis as there was no HD machine in the area where the patient lived. Since undergoing dialysis with CAPD access, the patient has a history of treatment at the Hospital 3 times with a diagnosis of peritonitis. Patient said that several dwellings were carried out in rooms that were not clean, and the patient also admitted that he rarely washed his hands before and after dwelling.

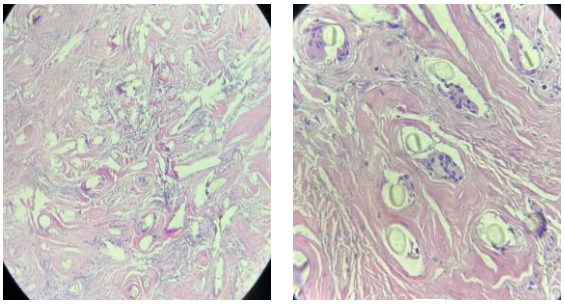
Physical examination was done with stable vital signs, on examination, the abdomen appeared symmetrical, no masses, no visible wounds or pus from the CAPD tip, auscultation examination heard bowel sounds 8 times per minute, palpation did not feel enlarged liver or spleen, Laboratory examination was performed with the results of Leukocytes $3.44x10^3/\mu L$, Hemoglobin 7.3 g/dL, MCV 71.1 fL, MCH 23.9 pg, PLT $105x10^3/\mu L$, BUN 155.8 mg / dL, Creatinine 24.4 mg/dL, e-LFG 1.8, Sodium 137, Potassium 4.57. Abdominal X-ray examination did not show any ileus or pneumoperitoneum. During laparoscopy, grade IV adhesions were found in the omentum and peritoneum, and an omental cake was seen, so it was decided to

release the CAPD cuff. Peritoneal fluid with debris was also seen (Figure 1).

A B

Figure 1. (A) Clinical photo of the patient after laparoscopy and CAPD removal. (B) CAPD fluid before CAPD removal

Biopsy results from the tissue at the catheter tip showed that the tissue consisted of connective tissue. In the connective tissue stroma, there was a wide distribution of fat vacuoles of varying sizes with histiocyte inflammatory cells surrounding the fat vacuoles of varying sizes, giving the impression of forming a granuloma structure. In some foci, multinucleated giant cells were also seen. A dense distribution of lymphoplasmacytic inflammatory cells and macrophages could be observed. There were no signs of dysplasia or malignancy. Histomorphology suggested a chronic inflammatory response with multinucleated giant cells of foreign bodies. Meanwhile, the biopsy results on the peritoneal fluid showed the distribution and clusters of polymorphonuclear leukocytes, neutrophils, and lymphocytes, inflammatory cells. Cytomorphology showed chronic suppurative inflammation. Peritoneal fluid culture was performed with isolated results of coagulase-negative Staphylococcus bacteria, which are normal flora on the skin. There were no complications after laparoscopy. After CAPD release, the patient returned to HD with AV Shunt access (Figure 2).



A B

Figure 2. (A) Histopathology of Catheter Tip (B) Histopathology of Catheter Peritoneum

Discussion

Although very rare, one possible complication in long-term PD patients is Encapsulated Peritoneal Sclerosis (EPS). The prevalence of EPS has been observed to vary between 0.4% and 8.9%, with an incidence of 0.7 to 13.6 per 1,000 patients per year, and the risk of occurrence after 5 years of PD is between 0.6% and 6.6%. The occurrence of EPS may be related to genetic factors, the volume of PD prescribed daily, exposure to dialysate glucose, use of biocompatible fluids, or a history of recurrent peritonitis.[7] EPS is associated with high morbidity and mortality. The reported mortality rate reaches 50%, usually within 12 months of diagnosis. However, the mortality rate depends on the severity of the disease, and not all deaths are directly caused by EPS.[8]

CAPD is indicated for all ESRD patients who require renal replacement therapy. Peritoneal dialysis requires patient independence, so patient selection is not only limited to medical and non-medical indications and contraindications, but also needs to consider several requirements. For the success of CAPD, prospective CAPD patients must meet several requirements, namely independent patients or those who help, living in a clean and healthy environment, and willing to undergo intensive training and comply with CAPD procedures.[2] In this case, the patient admitted that he did not maintain personal hygiene, especially when dwelling. Since CAPD was performed, the patient has had a history of hospitalization 3 times with a diagnosis of peritonitis. This is in accordance with the study that the main risk factor for EPS is the duration

of CAPD, with a higher incidence after more than five years, especially in patients with recurrent peritonitis.[4,6]

In this case, suspicion of EPS is based on mechanical disturbances in the form of irregular CAPD dwelling, history of recurrent peritonitis, and during laparoscopy, grade IV adhesions were found in the omentum and peritoneum, omental cake was seen, and peritoneal fluid was also seen with debris. Biopsy results from the tissue at the catheter tip showed that the tissue consisted of connective tissue, and histomorphology suggested a chronic inflammatory response with multinucleated giant cells of foreign bodies. Meanwhile, biopsy results on peritoneal fluid showed the distribution and clusters of inflammatory cells, polymorphonuclear leukocytes, neutrophils, and lymphocytes. The diagnosis of EPS is based on the presence of clinical symptoms due to intestinal obstruction that depend on the severity of the obstruction, structural disorders due to peritoneal fibrosis, namely thickening and intra-abdominal adhesions, accompanied by a picture of fibrous cocoon or omental cakes in the intestine, with laparotomy and/or laparoscopy.[6,8] The initial symptoms in EPS patients are nausea, vomiting, and weight loss. Sometimes, inflammatory symptoms, including fever, fatigue, and weight loss, can also occur. In the advanced phase, the symptoms that appear can be complaints of intestinal obstruction, constipation, and abdominal pain. CT Scan has been proposed as a screening tool, but EPS can occur in a short time or with normal CT results in asymptomatic or advanced-stage patients. Radiological examination in the form of a CT Scan will show a picture of peritoneal calcification, accompanied by intestinal thickening or dilation.[8] Laboratory results in EPS are generally non-specific; one of the examinations that may be used is peritoneal dialysis fluid analysis, which shows an increase in the number of white blood cells.[6]

Pathophysiology of EPS is still unclear. Initially, it was assumed that EPS occurs due to changes in the structure of the peritoneum, such as loss of mesothelium and progressive thickening of the submesothelial layer due to long-term PD use.[9] Peritoneum is normally lined by mesothelium and submesothelium. In patients with CAPD, dialysate fluid can cause some mesothelial cells to be released. The area between the mesothelium and submesothelium becomes thick and contains fibrotic cells. Furthermore, mesothelial cells will be lost and cause hyalinous degeneration of collagen fibers (hyalinized peritoneal fibrosis) after being continuously exposed to dialysate fluid for a long period of time. In addition, the walls of micro blood vessels, especially in postcapillary venules, show hyaline thickening with narrowing or obstruction of the lumen (hyalinized vasculopathy). This condition will then cause hyalinized peritoneal sclerosis (HPS), and increased peritoneal permeability will induce fibrin exudation and form neo-membranes on the peritoneal surface. Neo-membranes will cause adhesion and encapsulation of the intestine and eventually develop into EPS as described in Figure 3.[7]

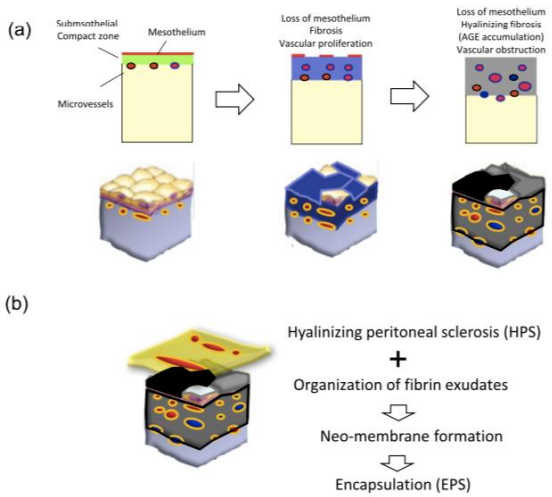


Figure 3. Pathophysiology of Encapsulated Peritoneal Sclerosis

The management of EPS can be in the form of medication, namely tamoxifen and prednisone. These drugs are given for at least three to four months, followed by tapering down prednisone for six to eight weeks. While non-medication management of EPS is carried out in patients with intestinal obstruction.[6] The recommended management of EPS with severe

symptoms is not to use CAPD for 4 to 12 weeks. In some patients, CAPD is finally stopped permanently and replaced with HD.[6,9] As in this case, when laparoscopy was performed, grade IV adhesions were found in the omentum and peritoneum, omental cake was seen, so it was decided to release the CAPD cuff and replace it with HD. A similar case was reported by the study of Fawzi et al in patients with intestinal adhesions, with surgical intervention and releasing the CAPD cuff.[6]

Conclusion

Encapsulated Peritoneal Sclerosis (EPS) is a complex condition that causes high morbidity and mortality rates in patients with Continuous Ambulatory Peritoneal Dialysis (CAPD). Diagnosis of EPS in these cases was based on mechanical disorders in the form of problems with dwelling, a history of recurrent peritonitis, and findings of grade IV adhesions in the omentum and peritoneum, omental cake, and peritoneal fluid with debris in laparoscopy. Biopsy results from the tissue at the catheter tip showed that the tissue consisted of connective tissue, and histomorphology suggested a chronic inflammatory response with multinucleated giant cells of foreign bodies. Although complications related to infections are more often found, non-infection complications such as EPS can also occur in CAPD Patients; therefore, clinicians need to be aware of this complication, especially in patients with a history of recurrent peritonitis.

Declarations

Ethics approval and consent to participate

This study received approval from the Ethics Committee of the Ngoerah Hospital.

Competing interests

The authors declare no conflict of interest

Acknowledgments

None.

Author's Contribution

Idea/concept: TDT. Design: GWM. Control/supervision: YK. Data collection/processing: TDT. Analysis/interpretation: GWM. Literature review: GWM. Writing the article: TDT. Critical review: GWM. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

References

1. Müller JVC, Ponce D. Infectious and mechanical complications in planned-start vs. urgent-start peritoneal dialysis: a cohort study. Brazilian J Nephrol. 2023;45(1):27–35. doi:10.1590/2175-8239-jbn-2021-0287en
2. Kandarini Y. CAPD Continuous Ambulatory Peritoneal Dialysis. Udayana University Press; 2021.
3. Ahbap E, Mazi EE, Basturk T, Sakaci T, Aykent MB, Unsal A. Peritoneal dialysis related non infectious complications: A single-center experience over 20 years. Clin Nephrol. 2023;100(1):19–26. doi:10.5414/cn111092
4. Khan SF. Updates on Infectious and Other Complications in Peritoneal Dialysis: Core Curriculum 2023. Am J Kidney Dis. 2023;82(4):481–90. doi:10.1053/j.ajkd.2023.03.011
5. Haggerty S. Surgical aspects of peritoneal dialysis. In: Surg Asp Perit Dial. 2017. p. 1–170.
6. Mudarres MF, Khan S. A Case Report and Clinical Insights on Encapsulating Peritoneal Sclerosis: A Rare yet Critical Complication of Peritoneal Dialysis. Cureus. 2024;16(8):e68344. doi:10.7759/cureus.68344
7. Nakayama M, Miyazaki M, Hamada C, Ito Y, Honda K. Pathophysiology of encapsulating peritoneal sclerosis: lessons from findings of the past three decades in Japan. Clin Exp Nephrol. 2023;27(9):717–27. doi:10.1007/s10157-023-02360-y
8. Brown EA, Bargman J, Biesen W, Chang

MY, Finkelstein FO, Hurst H. Length of time on peritoneal dialysis and encapsulating peritoneal sclerosis — Position paper for ISPD: 2017 update. Perit Dial Int. 2017;37(4):362–74. doi:10.3747/pdi.2017.00018

9. Goffin E, Krediet RT. CAPD Continuous Ambulatory Peritoneal Dialysis. Springer Nat Switz AG; 2021. 1–12 p.