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# Assisted peritoneal dialysis as an alternative for the patient with a hypersensitivity reaction to dialyser system components

**Abstract**

In patients suffering from end-stage kidney disease, the vast majority of renal replacement therapy is performed using haemodialysis. Peritoneal dialysis is less frequently chosen because, particularly in older patients, it is associated with challenges related to fluid exchange. An alternative approach might be assisted peritoneal dialysis, wherein trained relatives perform fluid exchange.

The objective was to present a case report of a patient diagnosed with hypersensitivity to dialysis membranes, which necessitated a transition to an alternative method of renal replacement therapy. Assisted peritoneal dialysis emerges as a promising option, particularly among elderly patients burdened with multiple comorbidities and frailty syndrome, offering the potential for improved quality of life.

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**Keywords: haemodialysis, assisted peritoneal dialysis, allergy to dialyser**

## INTRODUCTION

Chronic kidney disease (CKD) is becoming a growing global public health problem [1]. According to estimates, in 2020, approximately 4.2 million people in Poland will suffer from CKD with a significant proportion of patients unaware of it [2]. According to data from the Polish Nephrology Registry, in 2022 alone, 6,068 patients started renal replacement therapy with haemodialysis (HD) and peritoneal dialysis (PD), resulting in a total of over 20,000 people needing this treatment by the end of the year [3].

The vast majority of patients are treated with haemodialysis — peritoneal dialysis in 2022 accounted for 4.2% of total dialysis treatment. Patients over 65 years of age account for 29.5% of total peritoneal dialysis patients, compared to 58.3% of haemodialysis patients. This difference may be due to the need to perform dialysis fluid exchanges on their own for peritoneal dialysis treatment, which makes elderly patients with mobility or cognitive limitations concerned about this treatment modality.

A solution to this problem may be assisted peritoneal dialysis, in which trained family members will perform dialysis fluid exchanges. For patients in whom haemodialysis becomes infeasible, this will enable the continuation of renal replacement therapy. It is worth reminding patients that once started, the method of renal replacement therapy can be changed to another. According to available data from the Nephrology Registry from 2022, a significant percentage of patients (18.9%) converted from HD to PD; that is, 153 patients of a total of 809 started peritoneal dialysis, while from the percentage of conversions from PD to HD was only 3%, but this accounted for 581 patients of a total of 19389 on haemodialysis.

## CASE REPORT

A 69-year-old patient with left renal agenesis, chronic heart failure, chronic obstructive

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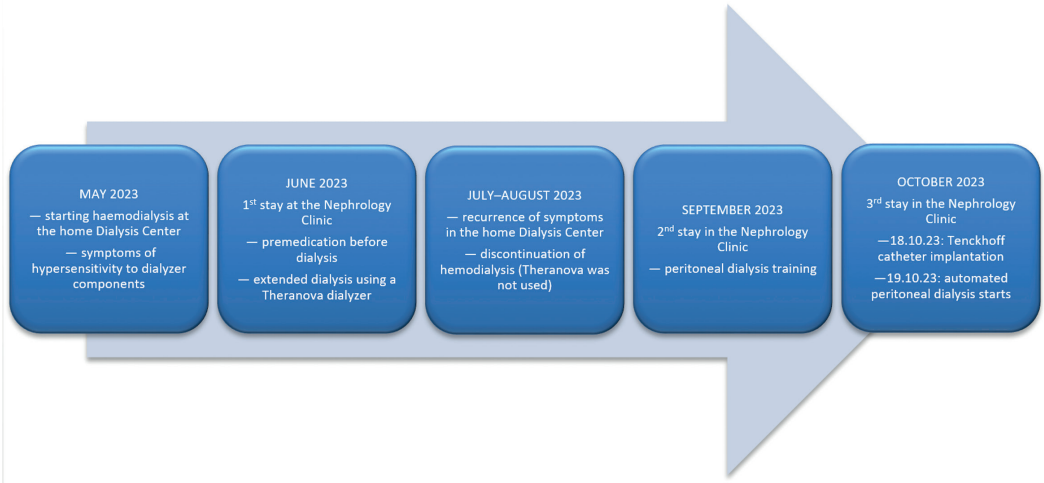


**Figure 1.** Clinical course and measures used in a patient with intolerance to haemodialysis treatments

pulmonary disease, alcoholic cirrhosis, undergoing renal replacement therapy by haemodialysis, was admitted to the Department of Nephrology, Transplantology and Internal Medicine for poor tolerance of haemodialysis procedures and suspected allergic reaction to dialyser membranes (Fx, HPS, LOPS). According to the records of the dialysis station, a drop in blood pressure, dyspnoea, bronchial spasm and loss of consciousness were observed after 10–15 min of haemodialysis treatment. Improvement was achieved after supplying fluid, corticosteroids (GCS) and oxygen therapy. At the parent dialysis station, attempts were made to dialyse the patient with different dialysers, using different anticoagulants, also without heparin, but without effect.

In the Department, a haemodialysis procedure was performed after premedication — 100 mg methylprednisolone, 2 mg clemastine and 80 mg famotidine were administered. The method was also changed to extended haemodialysis (HDx) using a Theranova dialyser. The dialysis procedure was performed without complications, and no adverse reactions were observed. Two more dialysis procedures were performed with premedication — glucocorticosteroids in a decreasing dose, before the last 100 mg of hydrocortisone. The patient was discharged with the recommendation to continue HDx and premedication before the procedure with clemastine and famotidine.

After discharge, the patient had a rapid recurrence of previous symptoms in the parent dialysis station. Given preserved diuresis, a decision was made to withhold further renal replacement therapy. The patient was again referred to the Department of Nephrology, and during his hospitalisation, we observed stable renal parameters (creatinine 6 mg/dL, urea 150 mg/dL). As no further treatment with haemodialysis was possible, we decided to conduct peritoneal dialysis training, which was also attended by the patient's family.

One month later, due to progression of renal disease (creatinine 7.2 mg/dL, urea 190 mg/dL), the patient was implanted with a Tenckhoff catheter and automatic peritoneal dialysis was started. The volume of exchanges was gradually increased, and the patient's family was trained in the procedure. The patient was discharged home and is conducting renal replacement therapy by assisted automated peritoneal dialysis. To this day, no complications were observed. Details of the timeline of conversion are shown in Figure 1.

## DISCUSSION

In recent years, the need for renal replacement therapy has occurred in an increasingly elderly patient population [3, 4]. Patients with CKD are characterised by significant comorbidity and advanced frailty syndrome, which may affect up to 40% of dialysis patients [5]. In end-stage renal failure, clinicians and patients are faced with a choice of renal replacement therapy, each with its own benefits and drawbacks (Tab. 1) [6]. However, the vast majority of patients over 65 years of age are treated with haemodialysis [7].

Some problems that can be encountered with this type of renal replacement therapy are hypersensitivity reactions. These can be anaphylactic, pseudo-allergic or of the delayed type. Agents causing them include substances

**Table 1** Comparison of haemodialysis and peritoneal dialysis in elderly patients, Brown et al. [5]

| Haemodialysis | Peritoneal dialysis |
|---|---|
| **Patient's point of view** | |
| **Benefits** | |
| Carried out by qualified medical personnel | Greater independence with regard to the possibility of carrying out treatments in the patient's home |
| Establishing social interaction during haemodialysis (e.g. with other patients, with medical staff) | Does not interfere with social activities |
| Regular medical assessment during treatments | It can also be performed by a carer (so-called assisted PD) |
| | Reduced frequency of contact with health care facilities (e.g. hospital, dialysis station) |
| | Does not require vascular access |
| | Flexibility in choosing CAPD or APD |
| | In the case of preserved residual renal function, the possibility of bypassing the dialysis procedure |
| | Easier travel (e.g. holidays, to visit family) |
| **Disadvantages** | |
| Impact on quality of life | Impact on quality of life |
| Adversely effects social functioning and family life | Need to perform the procedure in person (or with the aid of a carer) |
| Additional time while waiting for transport and commuting to the dialysis station | Storage space required for dialysis bags |
| Necessary recovery time immediately after treatment | Burden of repetitive dialysis treatments |
| Difficulty going on holiday or visiting family | Fear of infection or peritonitis |
| Need to create vascular access and maintain it | Requires the insertion of a Tenchoff catheter |
| **The doctor's perspective** | |
| **Benefits** | |
| Familiarity with haemodialysis and treating its complications as an unavoidable part of chronic treatment | Patient autonomy during home dialysis |
| Ease of organising treatments and starting them with the patient | Avoidance of haemodynamic disturbances |
| Few contraindications — reduced need for medical and psychological qualification | Longer lasting residual kidney function |
| Ease of achieving treatment adequacy | Flexibility of CAPD and APD |
| **Disadvantages** | |
| Risk of hypotension during surgery | Unfamiliarity with peritoneal dialysis (most doctors only see its complications) |
| Difficulty in creating vascular access | Not offering an older patient this option of renal replacement therapy due to fears that the patient will not be able to cope |
| Risk of catheter-related infection | Risk of infection |
| Transport costs to and from the dialysis station | Risk of technical failure, e.g. due to infection, inadequate clearance or ultrafiltration in the case of anuria |
| Reduced residual kidney function | |

APD — automated peritoneal dialysis; CAPD — continuous outpatient peritoneal dialysis; PD — peritoneal dialysis;

that were used in the past to rinse and disinfect the system (current dialysers are disposable), dialysis membranes, erythropoietin, iron and heparin [8]. It should be noted that hypersensitivity reactions to the dialyser system are not as common as in the past due to better biocompatibility of the materials used (dialysis membranes, drains) [9]. Examples of hypersensitivity reactions to substances such as ethylene oxide, which was used to sterilise dialysers, have been reported in the literature [10].

In our patient, the hypersensitivity reaction made it impossible to continue renal replacement therapy by haemodialysis at the

parent dialysis station, which did not have polymethylmethacrylate (PMMA) membrane dialysers (Theranova). The use of this dialyser ensures that the blood is cleansed of toxic compounds to a greater extent compared to classical dialysers and can contribute to a significant improvement in the quality of life and clinical condition of dialysis patients. Due to his older age, numerous comorbidities and cognitive impairment, it was also impossible to carry out renal replacement therapy by peritoneal dialysis alone. Thanks to family involvement, however, assisted peritoneal dialysis treatment became possible. From the patient's point of view, this had a positive impact on his quality of life and daily activities.

In Western Europe, for financial reasons, recommendations are being made to expand treatment options with this method. It is even possible to be treated by qualified medical staff at the patient's home [11]. Also, in Poland, some cases of peritoneal dialysis performed by nursing home staff after appropriate training were described several years ago [12]. It is worth noting that the use of this method in a patient with preserved diuresis does not imply the need to conduct several dialysis fluid exchanges per day. In the UK, older patients with frailty syndrome, for whom haemodialysis may have been too much of a burden, were initiated on an assisted continuous ambulatory peritoneal dialysis programme of two exchanges, with satisfactory results [13].

In conclusion, the method of assisted peritoneal dialysis in elderly patients with multiple burdens and frailty syndrome is a method that can provide the patient with an improved quality of life. The case of our patient describes the possibility of its application in a patient initially treated with haemodialysis that could not be continued and, at the same time, could not perform the procedure independently. Thus, we wanted to draw attention to the wider possibility of using peritoneal dialysis in Poland, including the use of assisted dialysis.

## Ethical statement:

The patient consented to the publication of the article. The patient's personal details were not disclosed.

## Author contributions:

All authors contributed to the conception and design of the article, the data collection and analysis, and the writing of the article and approved the final version for publication.

## Conflict of interest:

The authors report no conflicts of interest.

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