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Analysis of infectious complications in peritoneal dialysis according to the antiseptic used to cure the outflow orifice

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ABSTRACT

Introduction: The care of the peritoneal catheter exit site is vital because it affects the success and future of peritoneal dialysis.

General: To analyse infectious complications in peritoneal dialysis according to the antiseptic used to cure the exit site.

Material and Method: Descriptive observational study with retrospective data collection, with a duration of 90 months, from January 2015 to June 2022, in a population of peritoneal dialysis patients. An analysis was made of peritoneal catheter exit site infections and possible complications in the two periods, according to the antiseptic used, from January 2015 to December 2018 and January 2019 to December 2022. The variables collected were the antiseptic used in the two periods described (povidone-iodine and chlorhexidine soap), the rate of orifice infections, and the rate of infectious complications.

Results: Fifty patients were studied. Regarding exit wound infection, a reduction was observed in the chlorhexidine soap group (p=0.02). The rate of peritonitis was higher in the povidone group, although the results were not statistically significant.

Conclusions: Chlorhexidine soap showed a decrease in orifice infections and infectious complications.

Keywords: peritoneal catheter; chlorhexidine; povidone-iodine; exit site infection.

RESUMEN

Análisis de las complicaciones infecciosas en diálisis peritoneal en función del antiséptico utilizado en la cura del orificio de salida

Introducción: El cuidado del orificio de salida del catéter peritoneal, es de vital importancia debido a las implicaciones que puede tener sobre el éxito y futuro de la diálisis peritoneal.

Objetivo general: Analizar las complicaciones infecciosas en diálisis peritoneal según el antiséptico utilizado en la cura del orificio de salida.

Material y Método: Estudio observacional descriptivo con recogida de información de carácter retrospectivo, con una duración de 90 meses, desde enero de 2015 a junio de 2022, en una población de pacientes en diálisis peritoneal. Se realizó un análisis de las infecciones de orificio de salida del catéter peritoneal y de las posibles complicaciones en los dos periodos, según el antiséptico utilizado; de enero de 2015 a diciembre 2018 y de enero de 2019 a diciembre de 2022. Las variables recogidas fueron el antiséptico utilizado en los dos periodos descritos (povidona yodada y jabón de clorhexidina), la tasa de infecciones de orificio y la tasa de complicaciones infecciosas.

Resultados: Se estudiaron 50 pacientes. En relación a la infección del orificio de salida, se observó una reducción en el grupo de jabón de clorhexidina (p=0,02). La tasa de peritonitis, fue superior en el grupo de povidona aunque los resultados no fueron estadísticamente significativos.

Conclusiones: El jabón de clorhexidina mostró una disminución de las infecciones del orificio y en las complicaciones infecciosas.

Palabras clave: catéter peritoneal; clorhexidina; povidona yodada; infección del orificio de salida.

INTRODUCTION

Peritoneal dialysis (PD) is a renal replacement therapy for the treatment of chronic kidney disease that utilises the characteristics and behaviour of the peritoneal membrane as a semipermeable membrane[1]. It is a safe technique and can be easily learned at any age.

The catheter is a foreign body and frequently a source of infection, both cutaneous and peritoneal[2]. For this reason, care of the catheter exit site (ES) is essential due to its impact on the success and long-term viability of PD.

Measures to prevent exit-site infection (ESI) range from daily washing with soap and water to the use of different antiseptic solutions or topical antibiotics[3].

There is no single standardised protocol for ES care. Most approaches have demonstrated relative efficacy, but none has been shown to consistently guarantee long-term preservation and optimal condition of the ES[3-5].

Tunnel and exit-site infections represent the most frequent cause of morbidity in PD programmes and are a major contributor to technique failure[6]. In our unit, following an apparent increase in ESIs during the 2015–2018 period, the ES care protocol was modified. In 2019, povidone-iodine was replaced with chlorhexidine soap in an attempt to reduce the number of ESIs. Primary endpoint: to analyse ESIs and their associated infectious complications. Secondary endpoint: to compare the occurrence of ES infections according to the antiseptic used.

MATERIAL AND METHOD

Design and Participants

We conducted a descriptive observational study with retrospective data collection over a 90-month period from January 2015 to December 2022 in a population of PD patients.

All patients on renal replacement therapy in the Peritoneal Dialysis Unit during the study period were included if they met the following inclusion criteria: age ≥18 years, exit site at least 6 weeks after catheter implantation, and presence of a peritoneal catheter at the start of PD during the study period. Exclusion criteria were: presence of ESIat study entry and refusal to participate.

Two distinct follow-up periods were conducted, depending on the care protocol implemented in the unit at each time. The first period ran from January 2015 to December 2018, during which povidone-iodine was used as the antiseptic, and the second period from January 2019 to December 2022, when chlorhexidine soap was adopted as the antiseptic. Some patients were included in both periods and therefore received care with both antiseptics; for the purposes of analysis, these cases were assigned to the two predefined groups (povidone vs soap). Follow-up visits were scheduled every two months, during which nursing staff performed ES surveillance and care. If patients reported any suspected warning signs at the ES, the visit was brought forward. When an ESIwas confirmed, an ES culture was obtained in the outpatient clinic.

Study Variables

Collected variables included sociodemographic data (age and sex), time on PD, PD modality [CAPD (continuous ambulatory peritoneal dialysis) or APD (automated peritoneal dialysis)], antiseptic used for ES care (povidone-iodine or chlorhexidine soap), and therapy outcome (transfer to haemodialysis, transplantation, or death).

Outcome variables: incidence of ESI and peritonitis rate.

Data Collection

Study variables were extracted from medical records and entered into a Microsoft Excel® database.

Statistical Analysis

Data were analysed using SPSS version 26. Numerical variables were expressed as mean ± standard deviation or median

Procedure for ES Care Using Povidone–Iodine or Chlorhexidine Soap:

- Ensure that all necessary materials are available.
- Close doors and windows.
- Position the patient in the supine position.
- Put on a face mask and ensure that all other persons in the room also wear one.
- Perform hygienic handwashing.
- Prepare the materials.
- Wash hands with chlorhexidine soap and dry with single-use paper towels, using the same towel to close the room door.
- Apply alcohol-based hand rub.
- Remove the external dressing and the tie-shaped gauze.
- Clean the ES with povidone–iodine or chlorhexidine soap diluted with NS, placing a folded gauze beneath the catheter.
- If chlorhexidine soap has been used, rinse with normal saline and dry the area thoroughly with sterile gauze to prevent moisture.
- Place a gauze pad to prevent pressure injury.
- Cover the catheter with a sterile dressing.
- Secure the catheter with paper adhesive tape to prevent traction.

ES: exit site; **NS:** normal saline.

Figure 1. Procedure for ES care using povidone–iodine or chlorhexidine soap.

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with interquartile range depending on distribution. Categorical variables were expressed as frequencies and percentages. Normality testing was performed; non-parametric tests were used when distributions did not meet normality assumptions. Categorical comparisons were made using the Chi-square test or Fisher's exact test. Statistical significance was set at p <0.05.

ETHICAL CONSIDERATIONS

The study was approved by the Research Committee of *Hospital de Figueres*, *Fundació Salut Empordà*. Participant confidentiality was maintained in accordance with Spanish Organic Law 3/2018 on data protection and digital rights (LOPDGDD).

The study complied with Regulation (EU) 2016/679 of the European Parliament and Council (General Data Protection Regulation). Patients were informed verbally and in writing; after all questions were answered, written informed consent was obtained for voluntary participation.

The study was conducted in accordance with the ethical principles of the most recent version of the Declaration of Helsinki (18th World Medical Assembly, 1964) and Good Clinical Practice standards, always applying the highest level of patient protection.

RESULTS

A total of 42 patients were studied. The mean age was 63.4 years (SD, 14.7), and 71.4% (n=30) were men. The median time on peritoneal dialysis was 17.0 months (IQR, 19; P25: 7.75 and P75: 27).

The proportion of patients undergoing CAPD was 59%, APD was 36%, and 5% used both techniques.

Regarding treatment outcome, 43% of patients received a transplant, 33% were transferred to haemodialysis, and 24% died.

Table 1 illustrates patient characteristics according to the type of antiseptic used for ES care.

Patients in the povidone-iodine group had a significantly higher percentage of infections than those in the chlorhexidine soap group (p=0.01). A significant reduction in infection rate was also observed (p=0.02). Peritonitis rate was higher in the povidone group, although this difference was not statistically significant (p=0.7), as shown in **Table 2**.

Table 1. Patient characteristics according to the type of antiseptic used for exit-site care.

	Povidone–iodine group (n=21)	Chlorhexidine soap group (n=19)	p-value
Age (years)	63.32 (±16.24)	63,58 (±13,3)	0.87*
Sex- Men, n (%) Sex-Women, n (%)	26 74	42 58	0.38**
Months on dialysis (media±DE)	15.8 (±11.59)	18 (±10.91)	0.51*
Type of dialysis-CAPD, n (%) Type of dialysis-APD, n (%)	66.66 33.33	50 50	0.36**

Hypothesis testing: *Mann–Whitney U test; **Chi-square test.

Among patients who developed infection, the total number of ES infections during the study period was calculated. The povidone group experienced 43 infections, whereas the soap group experienced 9 infections.

The infection rate per year was 1.05 in the povidone group and 0.31 in the soap group (p<0.001, Fisher's exact test).

DISCUSSION

This study analysed peritoneal catheter ES infections and their associated infectious complications. The occurrence of exit-site infections was compared according to the antiseptic used during the 2 study periods in a total of 50 patients. It was observed that patients in the chlorhexidine soap group had a lower percentage of ES infections than those in the povidone-iodine group.

According to the Spanish Society of Nephrology (2007)[6], within its scientific and technical quality plan for peritoneal dialysis, reported catheter infection rates vary widely from 0.05 to 1.02 episodes/patient-year. In our study, patients using povidone-iodine had an ESI rate of 0.34 episodes/patient-year, which was higher than that of the chlorhexidine soap group (0.07 episodes/patient-year).

Table 2. Comparison of infection rates according to the antiseptic used for exit-site care.

	Povidone–iodine	Chlorhexidine soap	p-value
ESI, % (n)-Yes ESI, % (n)-No	45.2% (n=14) 54.8% (n=17)	10.5% (n=2) 89.5% (n=17)	0.01*
ESI rate (infections/person-year)	0.34	0.07	0.02**
Peritonitis rate (peritonitis/person-year)	0.12	0.07	0.7**

Contraste de hipóteisis: *Test exacto de Fisher, **Z-test
IOS: Infecciones del orificio de salida.

With respect to infectious complications such as peritonitis, no statistically significant differences were observed between the povidone-iodine and chlorhexidine soap groups, although peritonitis rates were lower in patients treated with chlorhexidine soap.

Our findings are consistent with former studies showing that chlorhexidine soap is associated with fewer infections compared with povidone-iodine, demonstrating lower ESI rates and peritonitis incidence in patients using chlorhexidine soap[7-11].

Other studies comparing povidone-iodine with soap and water without antiseptic[8,12] did not find statistically significant reductions in infection rates; however, Kopriva et al.[13] reported that povidone-iodine significantly reduced infection rates vs soap and water alone.

Chronic ES care should include daily or alternate-day washing with an antibacterial soap or antiseptic cleanser that is non-irritant and non-toxic[14]. This recommendation was applied in our patient cohort.

Limitations

The main limitations of this study include its retrospective design, single-centre setting, and limited sample size.

The COVID-19 pandemic may have influenced patient follow-up and clinic visits. We cannot exclude that high patient adherence to the protocol contributed to the favourable outcomes observed.

We suggest that continuous nursing surveillance and patient education improve the condition of the peritoneal catheter ES.

The dissemination of this clinical practice-based research could have a significant impact by encouraging other centres to adopt a unified exit-site care protocol for peritoneal catheters.

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Conflicts of interest

None declared.

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