

Maintenance of central venous access devices permeability in cancer patients

Manutenção da permeabilidade dos dispositivos de acesso venoso central em pacientes com câncer

Mantenimiento de la permeabilidad de los dispositivos de acceso venoso central en pacientes con cáncer

Valdemar Franco Cabrera^I; Juliana Coutinho de Paula Suguimoto^{II}; Ariane Polidoro Dini^{III};
Marília Estêvam Cornélio^{IV}; Maria Helena de Melo Lima^V

ABSTRACT

Objective: to update the knowledge on the maintenance of permeability of Central Vascular Access Devices (CVAD) in cancer patients. **Content:** Patients on chemotherapy often require safe, long-term CKD. Obstruction occurs in 36% of patients with CVAD inserted in a 2-year period, which can be classified as mechanical due to drug / mineral precipitation and clot formation. The nursing staff is responsible for taking care to maintain the permeability of these devices through Flushing and Locking. The use of heparin showed low evidence when compared to saline (SF), regarding the reduction of obstruction. **Conclusion:** the use of DES to maintain CVAD is safe, effective and has a lower financial cost.

Descriptors: Central venous catheters; patient safety; neoplasms; permeability.

RESUMO

Objetivo: atualizar o conhecimento sobre a manutenção da permeabilidade dos Dispositivos de Acesso Vascular Central (DAVC) em paciente com câncer. **Conteúdo:** os pacientes que fazem uso de quimioterápicos muitas vezes necessitam de DAVC seguros e de longa permanência; a obstrução ocorre em 36% dos pacientes com DAVC inseridos no período de 2 anos, que pode ser classificada como mecânica, por precipitação de medicamento/minerais e pela formação de coágulos. A equipe de enfermagem é responsável por realizar os cuidados para manter a permeabilidade desses dispositivos através do *Flushing* e *Locking*. O uso de heparina demonstrou baixa evidência quando comparado ao Soro Fisiológico (SF), em relação a diminuição da obstrução. **Conclusão:** o uso de SF na manutenção dos DAVC mostra-se seguro, eficaz e com menor custo financeiro.

Descritores: Cateteres venosos centrais; segurança do paciente; neoplasias; permeabilidade.

RESUMEN

Objetivo: actualizar los conocimientos sobre el mantenimiento de la permeabilidad del dispositivo de acceso vascular central (DAVC) en pacientes con cáncer. **Contenido:** los pacientes que usan quimioterápicos a menudo necesitan DAVC seguros y de larga permanencia. La obstrucción ocurre en el 36% de los pacientes con DAVC insertados en el período de 2 años y puede ocurrir por precipitación de medicamento / minerales y por la formación de coágulos. El equipo de enfermería es responsable de realizar los cuidados para mantener la permeabilidad de estos dispositivos a través del *Flushing* y *Locking*. El uso de heparina demostró una baja evidencia en comparación con el Suero Fisiológico (SF), en relación con la disminución de la obstrucción. **Conclusión:** el uso de SF en el mantenimiento de los DAVC se muestra seguros, eficaz y con menor costo financiero.

Descriptores: Catéteres venosos centrales; seguridad del paciente; neoplasias; permeabilidad.

INTRODUCTION

Central venous access devices (CVADs) are often made of silicone or polyurethane^{1,2}. They provide safe venous access for chemotherapy and contribute to maintaining the integrity of the patient's venous network³. Some devices are used for long periods and require frequent evaluations, especially in patients going through intermittent chemotherapy⁴. The Semi-Implanted Central Venous Catheter, the Fully Implanted Central Catheter, and the Peripheral Insertion Central Catheter are among the most used CVADs in the onco-hematological treatment. Maintaining the permeability of these catheters is crucial for the quality of life of these patients since, in addition to the chemotherapy treatment, this device is used for blood collection and administration of drugs such as analgesics and antibiotics^{1,4}.

^I Nurse. Continuing advanced studies in Oncology and Antineoplastic Treatment State University of Campinas. São Paulo, Brazil. E-mail: vdmcabrera1@gmail.com

^{II} Nurse. Oncology Outpatient Clinic at Unicamp Clinical Hospital. Master's student in Oncological Patient Care at the School of Medical Sciences. State University of Campinas. São Paulo, Brazil. E-mail: judepaula@hc.unicamp.br

^{III} Nurse. PhD Professor of Administration. State University of Campinas. São Paulo, Brazil. E-mail: adini@unicamp.br

^{IV} Nurse. PhD Professor of the Medical-Surgical Area. State University of Campinas. São Paulo, Brazil. E-mail: mariliacornelio@gmail.com

^V Nurse. Full Professor of the Fundamental Area. State University of Campinas. São Paulo, Brazil. E-mail: melolima@unicamp.br

According to the literature, the maintenance of the permeability of the CVADs can be performed with heparin or sodium chloride 0.9% (PS)^{3,5,6}. However, the long-stay increases the incidence of local complications, such as the obstruction of the catheter lumen, which leads to the need for change, replacement or removal, causing the interruption of treatment, comorbidities and increased cost to the health service⁷. Catheter obstruction in adult patients occurs in 36% of the CVADs with 2 years of being inserted⁸.

Catheter obstruction can be defined as partial occlusion, i.e., there is no return of blood, but with fluid infusion. In a complete occlusion, there is no fluid infusion or venous return. The factors related to the occlusion of the catheter lumen can be classified into three categories: mechanical dysfunction, precipitation of medications/minerals and clot formation^{9,10}. Malpositioning of the catheter tip, folded extensions, and inadequate fixation lead to mechanical occlusion. Regarding the precipitation of medications, precipitates can be formed inside the lumen after the administration of minerals, lipids or by incompatible medications. Thrombotic occlusion is related to the presence of fibrin and to the blood constituents that accumulate within the lumen or around the catheter extremity and the vessel¹¹. Thrombotic occlusions are more severe than others because they increase the risk of catheter-related vascular thrombosis. Besides that, the fibrin promotes bacterial growth and infection^{12,13}.

Given the relevance of maintaining the permeability of central venous access devices in the quality of life during cancer treatment, this study aimed to update the knowledge on maintaining the permeability of central vascular access devices (CVADs) in cancer patients.

CARE MEASUREMENTS IN MAINTAINING THE PERMEABILITY OF THE CVADS

Currently, the insertion and care measurements with CAVDs involves the participation of a multidisciplinary team, composed of nurses, oncologists, hematologists, radiologists, surgeons, infectologists and, in some institutions, there is the presence of Intravenous Therapy teams^{14,15}. On the other hand, the care measures with the maintenance of permeability are the nursing team's responsibility, and the venous Flushing and Locking are part of the standard care for the maintenance and prevention of complications of the CAVDs according to the guidelines^{10,16}.

According to the literature, Flushing means the washing of the catheter, performed with 0.9% Physiological Serum (PS), before and after fluid infusion, with a 10 ml syringe or one designed to produce low pressures. The injection of PS should be performed in whirling, with the pulsatile technique of instillation and pause between each ml in the time interval of 0.4 seconds and with positive pressure avoiding blood reflux to the catheter lumen. In an *in vitro* study it was verified that the whirling technique allows for a better removal of the protein material from the lumen of the device when compared to the technique of continuously infusing PS^{6,10,17}.

Locking, in turn, is considered an intra-luminal injection, performed with saline solution or heparin saline solution, made at time intervals and limited volume in order to keep the catheter permeable^{6,10}. There is no consensus in the literature regarding the appropriate dose for the heparinized solution, 150 IU/3 ml, 500 IU/5 ml, 1000 IU/3 ml when compared to PS in maintaining permeability^{13,18}. The interval for performing the Locking for the CAVD is 4 weeks. However, several studies have shown that the extension of this interval for performing the Locking is effective and safe in maintaining permeability. A recent study corroborates the previous ones, where no difference was observed between the short and long periods in the Locking interval with a complication rate when the catheter is in intermittent use^{19,20}.

Several systematic review studies demonstrated low evidence for the superiority of Locking with heparin when compared to PS in the CAVD occlusion prevention. Recently, one of these reviews was re-evaluated and it was observed that the Locking with intermittent heparin results in a lower risk for CAVD occlusion when compared to PS in adults. However, the low quality of evidence was maintained to sustain another position of the 2014 conclusion²¹. Recent data demonstrated that the mean cost for maintaining the permeability of the heparinized CAVDs in patients in inpatient units for our Brazilian reality corresponds to US\$ 9.71 (SD=1.35) and that with PS it is US\$ 8.81 (SD=1.29), a reduction of US\$ 0.90/procedure²².

BEST PRACTICES

The updated knowledge of nurses on adequate care with the CAVDs, the presence of expert groups in health institutions and patients being well oriented regarding care are essential elements in the prevention of complications related to these catheters²³⁻²⁵. For the care management in the daily management of the CAVDs, the nursing staff must be encouraged to keep up to date, create strategies for continuing education, stimulate behavior changes, implement

new technologies and institute protocols that can assist procedures based on scientific evidence²⁶⁻²⁸, since data from the Cancer Institute estimate 420 thousand new cases of cancer between 2018 and 2019²⁹.

CONCLUSION

The treatment will most often require the use of chemotherapy with a CAVD, with safe assistance and promotion of quality of life. Occlusion is a complication that can be reduced with the implementation of Flushing and Locking institutional protocols. Given the low evidence that the use of heparin is superior to PS in the prevention of the occlusion of the catheters' lumens, and with knowledge of the benefits of PS for maintaining permeability, together with recent information on the maintenance costs of these catheters, it is possible to consider that the use of PS is safe and effective and brings a lower financial cost for the maintenance of the CAVDs in intermittent use.

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