

The Use of the Water-Flushing Technique in the Maintenance of Totally Implanted Catheters and in the Reduction of Infections

ORIGINAL

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Abstract

Background: Port-a-Cath catheters have been widely used in the clinical systemic therapy of cancer owing to the level of safety and effectiveness provided to patients during the treatment. The current study aimed to evaluate the decrease in risk of infection and the permeability condition of totally implanted catheters by using distilled water in the maintenance of Port-a-Caths.

Methods and findings: Over the period between November 2008 and October 2014, a total of 109 patients with Port-a-Cath were attended to at the Ambulatory Chemotherapy Treatment Center from the Santa Marcelina Hospital in São Paulo, Brazil. The focus was on patients who had the totally implanted catheters, encompassing not only the treatment itself but also the maintenance of the devices. From the total sample, only 5 patients (4.6%) had catheter infection. Statistical analysis was performed using STATA 11.0.

Conclusion: the use of distilled water in the maintenance of a Port-a-Cath has suggested to be effective and safe regarding infection risks and the device permeability.

Introduction

Despite the considerable progress achieved in medicine, especially in the oncology field, adjuvant chemotherapy has been the treatment model of choice among all treatment modalities after a surgical procedure. Be-

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sides reducing the risk of relapses, it also increases patients' life expectancy. In this scenario, multiple punctures for the administration of chemotherapeutic agents with frequent tissue damages caused by vesicant/ irritant drug extravasation can be observed. [1-3]

The use of central venous catheters (CVC) for the administration of chemotherapeutic agents and drugs, hemotransfusion or parenteral nutrition has gradually been increasing. [1,4] More specifically, totally implanted CVCs, also known as Port-a-Caths, have been more and more frequently employed in this context given the fact they bring fewer complications to the patient when compared with the other central venous catheters. In addition to that, they require less manipulation, a lower frequency in use of heparin flush and reduce the need of dressing, thus contributing to facilitate daily activities and providing individuals with a better quality of life. [2, 3, 5]

Nevertheless, totally implanted CVCs demand constant maintenance so that obstructions and the inadequate performance of the device can be prevented, avoiding risky removals and replacements. Along with the many maintenance techniques for the Port-a-Cath, issues varying from thrombocytopenia induced by heparin to catheter-related bloodstream infections may come up. However, no specific effective recommendations for each practice can be found in the literature. [6, 7].

The aim of the current study was to determine the prevalence of infections when using water-flushing technique in the maintenance of totally implanted catheters and in the reduction of infections.

Methods

This is a transversal study that took place in the chemotherapy ambulatory care unit of the Santa Marcelina Hospital in São Paulo, Brazil. The sample was composed of 109 patients, with ages ranging from 16 to 88 years, who had a Port-a-Cath implan-

ted between November 2008 and October 2014. The device was used either for the administration of chemotherapy infusion, medications and blood derivatives or by those patients who were there for the quarterly maintenance of the catheter after their treatment completion.

Data were collected straight from the patients' medical records, and all nursing entries were evaluated during the established period. Within the collection, we gathered information like age, sex, type of tumor, date and site where the Port-a-Cath was implanted, the products administered through the catheter (chemo, medication or blood derivatives), the presence or absence of catheter or catheter-related infection, the need of catheter removal and the number of water flushes performed in patients under maintenance treatment only.

The variables sex distribution, implantation site, use of medications, chemotherapy, blood derivatives and the presence of infections were expressed as absolute and relative frequencies. Other variables like age, number of days with implant, number of water flushes and punctures were expressed as median (25-75 percentile) due to the uneven distribution (Shapiro-Wilk test, $p < 0.05$). The correlation between the number of punctures and the number of water flushes was tested by Spearman coefficient ($p = 0.95$). Statistical analysis was performed using STATA 11.0.

Results

A total of 109 patients with implanted catheter were evaluated. Among those, 44.9% were males and 55.1% were females. Regarding the device implantation site, 82.6% of the studied patients had it placed in the right subclavian vein. The studied sample characterization is shown in **Table 1**.

As to the objective of the use of the device, it could be observed that 100% of the patients were undergoing chemotherapy, with a rate of 4.6% of individuals with catheter-related infection develo-

Table 1. Sample characteristics.

Sample Characterization	n	%
Sex		
Male	49	44.9
Female	60	55.1
Site		
RSV ^a	90	82.6
LSV ^b	13	11.9
RUL ^c	1	0.9
LUL ^d	5	4.6
Median (25-75 percentile)		
Age	47.5	(30 - 58.5)
Days with Implant	269	(235 - 337)
p.25 - p.75: 25-75% percentile respectively. a: Right subclavian vein, b: Left subclavian vein, c: Right upper limb, d: Left upper limb.		

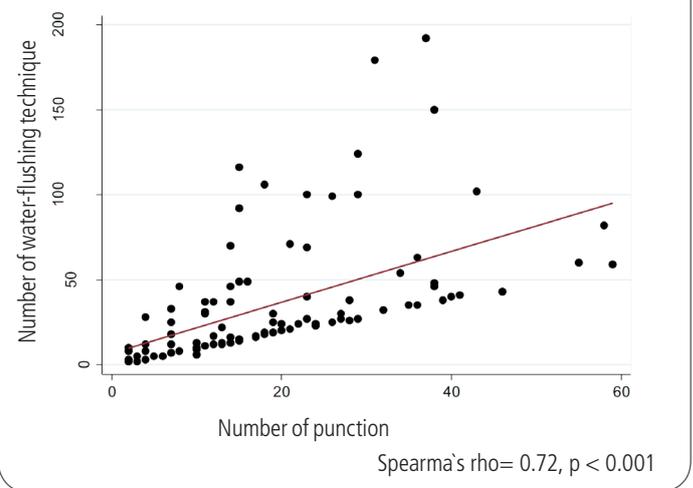
ped during the treatment. The clinical profile of the sample can be seen in **Table 2**.

Table 2. Patients clinical profile.

Clinical Profile	n	%
Medications		
Yes	109	100
No	-	-
Chemotherapy		
Yes	109	100
No	-	-
Blood Derivatives		
Yes	28	25.7
No	81	74.3
Infection		
Yes	5	4.6
No	104	95.4
Median (25-75 percentile)		
Water Flushes	25	(13 - 43)
Punctures	15	(11 - 26)
p.25 - p.75: 25-75% percentile respectively.		

Among the patients who did not present the infection, a positive correlation between the number of punctures and the number of water flushes could be noted (**Figure 1**).

Figure 1: Correlation between the number of punctures and the number of water flushes in individuals without infection.



Discussion

Therapeutic approaches in oncologic patients have been more and more aggressive, especially in regard to systemic treatment modalities, which require safe venous access. In this casuistic, totally implanted CVCs are of utmost importance concerning the safety of the patient and the decrease in risk of serious complications.

Taking into consideration comorbidities like peripheral vascular diseases and vascular fragility when the administration of chemotherapy by intravenous route is made necessary, it can be observed that totally implanted CVCs have been widely used as a safer device for the patient. Besides chemotherapy treatment, Port-a-Caths are frequently used for the administration of medications, blood derivatives, parenteral nutrition and specimen collection for laboratory analysis. [1, 2, 4, 5]

Regarding the maintenance of the device, the use of heparin or saline solution prevails over other methods of permeability preservation. However,

maintenance guidelines are followed according to the directions provided by manufacturers, and literature data concerning the type and amount of solution to be employed as well as maintenance intervals are conflicting. [1-3]

The results of this study revealed that it is possible to use distilled water for the Port-a-Cath maintenance since the infection rate here found was of 4.6%. Besides, among the evaluated sample, no difference in effectiveness was found between the use of distilled water and other methods mentioned in the literature; thus, its use in the maintenance of totally implanted CVCs has suggest to be effective and safe regarding infection risks and the device permeability.

Despite the lack of evidence concerning the quality in the use of heparin and saline solution in the prevention of a totally implanted CVC blockage and infection of its insertion site, in the published articles here cited the use of distilled water as an effective method in the maintenance of this device was not mentioned.

Conclusion

The objective of this study was to propose the use of the water-flushing technique in the maintenance of totally implanted catheters as a safe and effective method. The gap between the conceptual framework on the best methods for the maintenance of this device, whose focus is to decrease infection risks owing to the reduction in manipulation, and its permeability integrity, was the motivating and guiding source for the development of this study. In conclusion the technique with water flushing can be used to maintenance of totally implanted catheters. Furthermore more studies comparing it to other techniques are necessary to clarify these results.

Conflict of interest

None

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