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RESEARCHES REGARDING THE CENTRAL VENOUS CATHETER MANAGEMENT IN DOGS UNDERGOING HEMODIALYSIS

Alina ȘTEFĂNESCU, Bogdan Alexandru VIȚĂLARU

Faculty of Veterinary Medicine Bucharest, Splaiul Independenței 105, Bucharest, Romania

Corresponding author email: alexandrumv@yahoo.com

Abstract

Central venous catheter associated infections are the major cause of morbidity and mortality in patients undergoing hemodialysis. Lockings with antibiotics associated with heparin are used for both prophylaxis of infections and central venous catheter longevity. The present study was conducted on 20 dogs treated in the Hemodialysis Clinic from the Faculty of Veterinary Medicine Bucharest. 10 dogs received a locking with 2500 IU/ml heparin combined with vancomycin 2.5 mg/ml and 10 had locking with 5000 IU/ml heparin. Locking solutions were maintained for 24 hours in each patient. Local reactions were observed on the jugular vein, and the central venous catheter function was evaluated in each patient. Catheters were maintained at least 10 days. There were no local reactions in the batch with vancomycin and heparin locking. In the heparin locking batch, local reactions occurred in three subjects on the third day, and central venous catheter functioning progressively altered until day 10. Locking with heparin and vancomycin are an effective alternative, the catheter having a longer maintenance period. Combining an antibiotic with heparin provides superior results to prevent catheter-related infections.

Key words: *hemodialysis, catheter, infection, heparin, antibiotic.*

INTRODUCTION

Central venous catheter (CVC) use is increasingly higher in veterinary practice in the management of critical patients when peripheral venous access is difficult or even impossible, and is the primary element in the therapy of patients with acute or chronic renal failure undergoing hemodialysis (HD). Vascular access is the most important basic requirement of successful extracorporeal renal replacement therapy (ERRT) and an adequately functioning hemodialysis catheter allows for smooth and efficient patient management. Catheter manipulations maneuvers disturb the fibrinolytic system, triggering a cascade of coagulation and inflammation at this level. Finally, if the endogenous fibrinolytic system has the ability to excess coagulation, thrombosis occurs in the catheter.

Central venous catheter associated infections is a major cause of morbidity and mortality in patients undergoing hemodialysis regardless of the duration of therapy.

A standard therapy management of hemodialysis catheter-related infections and bacteremia management involves both catheter replacement and systemic antibiotics therapy. Therefore, lockings of antibiotics associated with heparin are used for the infections prophylaxis and the longevity of the central venous catheter.

Since the antibiotic does not penetrate into the body and remains strictly into the catheter, its toxicity is not of concern for the renal function.

Therefore the purpose of this study is driven by the need to maintain central venous catheter perfectly functional for a longer period of time, given the purpose for which it is used (hemodialysis) and to standardize a method as better locking catheter.

MATERIALS AND METHODS

Local reactions were observed in the jugular vein area, and the central venous catheter function was evaluated in each patient. For each patient, the catheters were maintained for at least 10 days.

In the 5000 I.U./ml sodium heparin locking batch, local reactions (hyperemia or inflammation, or both) occurred in 6 patients from day 3 and the catheter function progressively altered.

In the 2500 I.U./ml sodium heparin combined with 2.5 mg/ml vancomycin locking batch,

there were no local reactions and the catheter function has been kept constant in the proper parameters throughout its use.

RESULTS AND DISCUSSIONS

Local reactions were observed in the jugular vein area, and the central venous catheter function was evaluated in each patient. For each patient, the catheters were maintained for at least 10 days.

In the 5000 I.U./ml sodium heparin locking batch, local reactions (hyperemia or inflamemation, or both) occurred in 6 patients from day 3 and the catheter function progressively altered.

In the 2500 I.U./ml sodium heparin combined with 2.5 mg/ml vancomycin locking batch, there were no local reactions and the catheter function has been kept constant in the proper parameters throughout its use.

Tabel 1. Representation of the catheter function and local reactions occurrence for days one to five in the batch with 5000 I.U./ml sodium heparin locking

Crt. No.	PATIENT Breed, Age, Sex.	DAY 1 Local reaction (R) / Catheter function (F)	DAY 2 Local reaction (R) / Catheter function (F)	DAY 3 Local reaction (R) / Catheter function (F)	DAY 4 Local reaction (R) / Catheter function (F)	DAY 5 Local reaction (R) / Catheter function (F)
1.	HUMPHREY, BEAGLE, 13 YO, M	R - - - F + + +	R - - F + + +	R + F + +	R + F + +	R + F + +
2.	REX, GERMAN SHEPHERD, 9 YO, M	R - - - F + + +	R - - - F + + +	R + F + +	R + F + +	R + F + +
3.	PUPICEL, SHAR-PEI, 5 YO, M	R - - - F + + +	R - - F + +	R + F + +	R + F + +	R + F + +
4.	RICKY, ROTTWEILER, 7 YO, M	R - - - F + + +	R - - F + + +	R + F + +	R + F + +	R + F + +
5.	ADOLF, GOLDEN RETRIEVER, 13 YO, M	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - F + + +	R - - F + + +
6.	NERO, LABRADOR, 6 YO, M	R - - - F + + +	R - - F + + +	R + F + + +	R + F + +	R + F + +
7.	BARCCA, GERMAN SHEPHERD, 7 YO, F	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
8.	DELTA, CANE CORSO, 5 YO, F	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
9.	NORI, GOLDEN MIXED BREED, 8 YO, M	R - - - F + + +	R - F + + +	R + F + +	R + F + +	R + F + +
10.	CLEO, GERMAN SHEPHERD, 2 YO, F	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +

Tabel 2. Representation of the catheter function and local reactions occurrence for days six to 10 in the batch with 5000 I.U./ml sodium heparin locking

Crt. No.	PATIENT Breed, Age, Sex.	DAY 6 Local reaction (R) / Catheter function (F)	DAY 7 Local reaction (R) / Catheter function (F)	DAY 8 Local reaction (R) / Catheter function (F)	DAY 9 Local reaction (R) / Catheter function (F)	DAY 10 Local reaction (R) / Catheter function (F)
1.	HUMPHREY, BEAGLE, 13 YO, M	R + F +	R + F +	R + + F +	R + + F +	R + + + F -
2.	REX, GERMAN SHEPHERD, 9 YO, M	R + F + +	R + + F +	R + + F +	R + + F +	R + + + F -
3.	PUPICEL, SHAR-PEI, 5 YO, M	R + F + +	R + F + +	R + F + +	R + + F + +	R + + F +
4.	RICKY, ROTTWEILER, 7 YO, M	R + F + +	R + F + +	R + F + +	R + F + +	R + + F + +
5.	ADOLF, GOLDEN RETRIEVER, 13 YO, M	R - - F + + +	R - - F + +	R - - F + +	R - F + +	R - F + +
6.	NERO, LABRADOR, 6 YO, M	R + + F + +	R + + F +	R + F -	R + + F - -	R + + F - -
7.	BARCCA, GERMAN SHEPHERD, 7 YO, F	R - - - F + + +	R - - - F + + +	R - - F + + +	R - - F + + +	R - - F + + +
8.	DELTA, CANE CORSO, 5 YO, F	R - - F + + +	R - - F + + +	R - - F + +	R - - F + +	R - - F + +
9.	NORI, GOLDEN MIXED BREED, 8 YO, M	R + F +	R + F - -	R + + F - -	R + + F - - -	R + + + F - - -
10.	CLEO, GERMAN SHEPHERD, 2 YO, F	R - - - F + + +	R - - - F + + +	R - - F + + +	R - - F + +	R - - F + +

Table 3. Representation of the catheter function and local reactions occurrence for days one to five in the batch with sodium heparin and vancomycin locking

Crt. No.	PATIENT Breed, Age, Sex.	DAY 1 Local reaction (R) / Catheter function (F)	DAY 2 Local reaction (R) / Catheter function (F)	DAY 3 Local reaction (R) / Catheter function (F)	DAY 4 Local reaction (R) / Catheter function (F)	DAY 5 Local reaction (R) / Catheter function (F)
1.	PEPE, ABRUZZI SHEPHERD, 5 YO, M	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
2.	DARIUS, MIXED BREED, 7 YO, M	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
3.	MURPHY, SHAR-PEI, 5 YO, M	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
4.	FOXY, CHOW CHOW, 8 YO, F	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
5.	AKSEL, GOLDEN RETRIEVER, 6 YO, M	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
6.	DONNA, MIXED BREED, 2 YO, F	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
7.	MAX, PITTBULL, 3 YO, M	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +
8.	MARK, AMSTAFF, 2 YO, M	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + +	R - - - F + +
9.	BELLA, MIXED BREED, 12 YO, F	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +	R - - - F + + +

Table 4. Representation of the catheter function and local reactions occurrence for days five to 10 in the batch with sodium heparin and vancomycin locking

Crt. No.	*PATIENT Breed, Age, Sex.*	*DAY 6 Local reaction (R) Catheter function (F)*	*DAY 7 Local reaction (R) Catheter function (F)*	*DAY 8 Local reaction (R) Catheter function (F)*	*DAY 9 Local reaction (R) Catheter function (F)*	*DAY 10 Local reaction (R) Catheter function (F)*
1.	*PEPE, ABRUZZI SHEPHERD, 5 YO, M*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*
2.	*DARIUS, MIXED BREED, 7 YO, M*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*
3.	*MURPHY, SHAR-PEI, 5 YO, M*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*
4.	*FOXY, CHOW CHOW, 8 YO, F*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*
5.	*AKSEL, GOLDEN RETRIEVER, 6 YO, M*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + +*	*R - - - F + +*	*R - - - F + +*
6.	*DONNA, MIXED BREED, 2 YO, F*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*
7.	*MAX, PITTBULL, 3 YO, M*	*R - - - F + + +*	*R - - - F + +*	*R - - - F + +*	*R - - - F + +*	*R - - - F +*
8.	*MARK, AMSTAFF, 2 YO, M*	*R - - - F + +*	*R - - - F + +*	*R - - - F + +*	*R - - - F + +*	*R - - - F + +*
9.	*BELLA, MIXED BREED, 12 YO, F*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + +*	*R - - - F + +*	*R - - - F + +*
10.	*LARA, LABRADOR, 9 YO, F*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + + +*	*R - - - F + +*	*R - - - F + +*

Legend:

R - moderate local hyperemia;
R - - light local hyperemia;
R - - - absent local hyperemia;
R + severe local hyperemia;
R + + severe local hyperemia and the occurrence of local inflammation;
R + + + severe local hyperemia and the occurrence of local infection;
F - catheter function in only 2 - 3 patient position;
F - - catheter function in only 1 - 2 patient position;
F - - - catheter function in only 1 patient position;
F + hard catheter function;
F + + mild catheter function;
F + + + perfect catheter function.

The picture (Figure 1) was obtained after the necropsy examination at the request and with the consent of the owner, by the benevolence of the Pathological Anatomy Discipline of the Faculty of Veterinary Medicine in Bucharest.

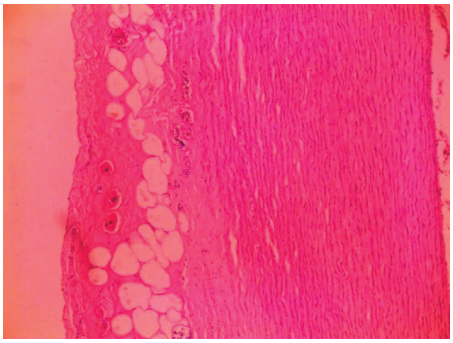

Figure. 1. The histological aspect of the transverse section through the cranial vena cava at the incidence with the catheter tip in a patient undergoing hemodialysis, whom died from cardiopulmonary arrest 7 days after central venous catheter assembly

CONCLUSIONS

The heparin and vancomycin locking is a better alternative, patients being protected from various local inflammatory infections or reactions, and the catheter has a longer duration of operation to complete hemodialysis therapy. Combining an antibiotic with heparin provides an alternative to stop infections and inflamemation associated with the central venous catheter.

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