

CHITOSAN-BASED DRESSING DECREASES BLEEDING TIME FROM HEMODIALYSIS ACCESS PUNCTURE WOUND BLEEDING

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Introduction

Patients on chronic hemodialysis (HD) with acquired coagulopathy often tend to prolong bleeding from the access puncture sites following needle extraction. The common practice of direct pressure with pad gauze, which according to our experience may last between 30-45 minute, may induce graft thrombosis and reduce graft survival.

More over, the delayed hemostasis requires additional staff and patient's time which is inconvenient and may increase costs. The HemCon[®] Bandage (HemCon Medical Technologies, Inc.) is a lyophilized chitosan-acetate based hemostatic dressing with a mode of action that is independent of coagulation factors and platelet function that may offer a more effective hemostasis.

The aim of the study:

A direct comparison between pad gauze and a chitosan dressing (HemCon[®] Bandage) in time to achieve hemostasis from the access punctures sites.

Methods

Included in the study HD patients with a tendency to prolong bleeding from their puncture access sites (at least more than 10 min). For each patient either regular pad gauze (often supplemented with gelatin sponge - Cutanplast[®] 1x1x1cm) or the chitosan dressing were applied, alternating between the two for a total of 10 treatments (5 times for each dressing). The protocol for the use of the chitosan dressing is presented in figures 1A and 1B.

Results

Two hundred and eighty eight treatments (144 for each dressing) were applied in 15 HD patients (patients characteristic are shown in table 1). Using the chitosan dressing hemostasis was achieved within 2 minutes in 78.4% of the applications. The success rate was increased to 98.6% with a second 4 minute application. A third application was needed only in two occasions (Table 2). There was no single case of late out-of-hospital bleed. The average time for induction of hemostasis was significantly shorter with the chitosan dressing as compared to the pad gauze: 2.9 vs. 18.6 minutes for the "arterial" access site and 2.7 vs. 13.4 minutes for the "venous" access site, respectively [P<0.005 Figure 2].

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Discussion

The chitosan hemostatic dressing is a complex carbohydrate derived from chitin [N-acetyl D-glucosamine]. Its hemostatic effect is independent of coagulation factors and is based mainly on its ability to interact with red blood cells [1]. Data from several animal models of vascular, parenchymal and mucous membrane bleeding have shown promising results in achieving hemostasis with and without the presence of coagulopathy [2]. These observation are further supported by accumulating clinical data [3,4]. The current study demonstrates the efficacy of the chitosan compared to a regular pad gauze with a significant decrease in time to hemostasis at dialysis puncture access sites (Figure 3). This may be translated to an increase in graft longevity and the patient's quality of life.

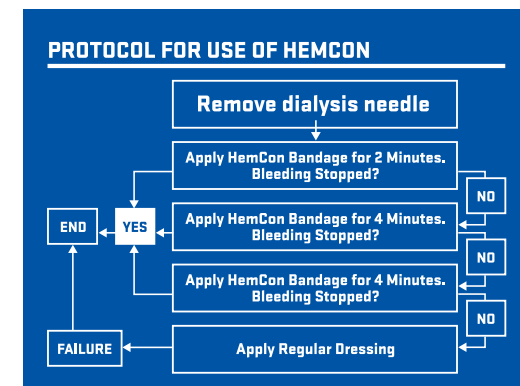


FIGURE 1A - Protocol for Use of HemCon

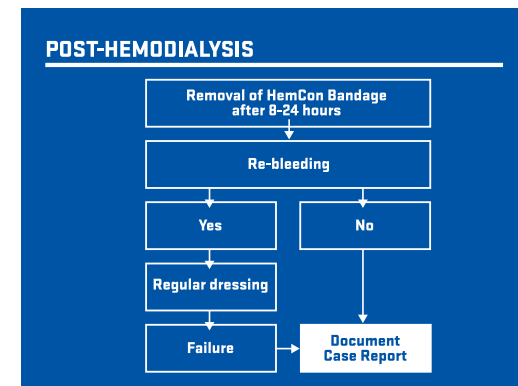


FIGURE 1B - Post-Hemodialysis

GENERAL DATA	
# of patients	15
M/F	10/5
Age (range)	76.6 (54-93)
Fistula	11
Graft	4
Flow (ml/min)	300 - 800
Aspirin/Warfarin	7/4
Thrombocytopenia	1 (-60,000/uL)

TABLE 1 - General Data

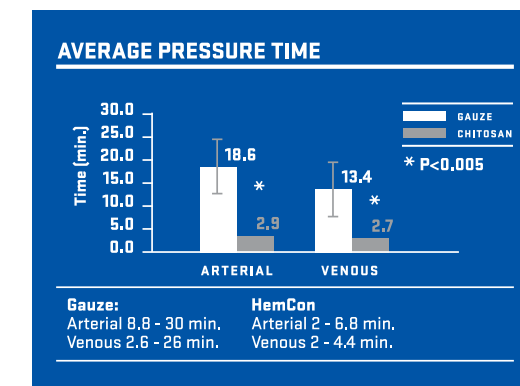


FIGURE 2 - HemCon Bandages stopped bleeding significantly faster than gauze on both the arterial and venous access sites.

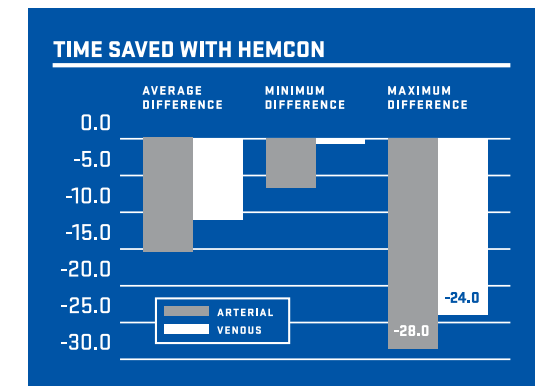
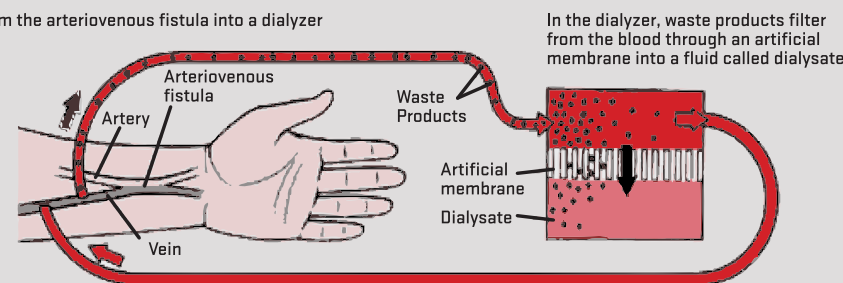


FIGURE 3 - Use of the HemCon Bandage saved patient time from roughly 30-60 minutes per visit.

HEMODYALYSIS

Blood is pumped from the arteriovenous fistula into a dialyzer



Purified blood is pumped from the dialyzer into the arteriovenous fistula

HEMCON APPLICATIONS		# SUCCESSFUL HEMCON APPLICATIONS (%)			# FAILED HEMCON APPLICATIONS (%)		
	# Needle Extractions	1st Application 2 minutes	2nd Application 4 minutes	3rd Application 4 minutes	1st Application 2 minutes	2nd Application 4 minutes	3rd Application 4 minutes
ACCESS POINT #1	72	58 (80.6%)	71 (98.6%)	72 (100%)	14 (19.4%)	1 (1.4%)	0
ACCESS POINT #2	72	55 (76.3%)	71 (98.6%)	72 (100%)	17 (23.6%)	1 (1.4%)	0
TOTAL	144	113 (78.4%)	142 (98.6%)	144 (100%)	31 (21.5%)	2 (1.4%)	0

TABLE 2

References

1. Thatté HS, Zagarins SE, Amiji M, Khuri SF. Poly-N-acetyl glucosamine-mediated red blood cell interactions. J Trauma. 2004 Jul;57(1 Suppl):S7-12.
2. Gustafson SB, Fulkerson P, Bildfell R, Aguilera L, Hazzard TM. Chitosan dressing provides hemostasis in swine femoral arterial injury model. Prehosp Emerg Care. 2007 Apr-Jun;11(2):172-8.
3. Wedmore I, McManus JG, Pusateri AE, Holcomb JB. A special report on the chitosan-based hemostatic dressing: experience in current combat operations. J Trauma. 2006;60:655-8.
4. Bachtell N, Goodell T, Grunkemeier G, Jin R, Gregory K. Treatment of Dialysis Access Puncture Wound Bleeding with Chitosan Dressings. Dialysis and Transplantation 2006; Nov: 1-6.



Vascular access site of hemodialysis.



Placement tape is loosened.



With pressure applied, the catheter is removed.



A small amount of blood is required for the HemCon Bandage to adhere to the wound. The bandage carries a positive charge and this unique design attracts negatively charges red blood cells to form a clot.



The HemCon Bandage was successfully used to stop bleeding in patient following hemodialysis.