

From The Battlefield To The Street — Experience Of A Suburban Fire/EMS Agency With Chitosan Dressing

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From The Battlefield...



...To The Street



Title: Pre-hospital use of the HemCon® Bandage

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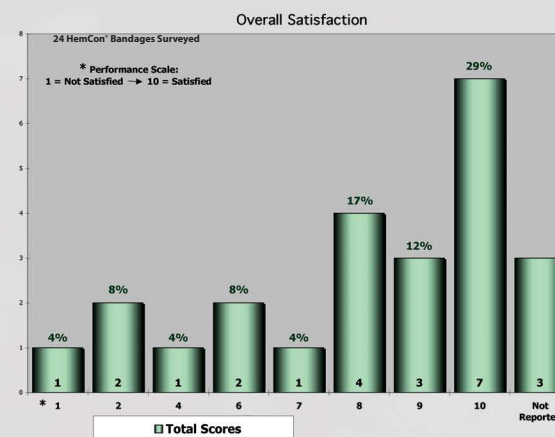
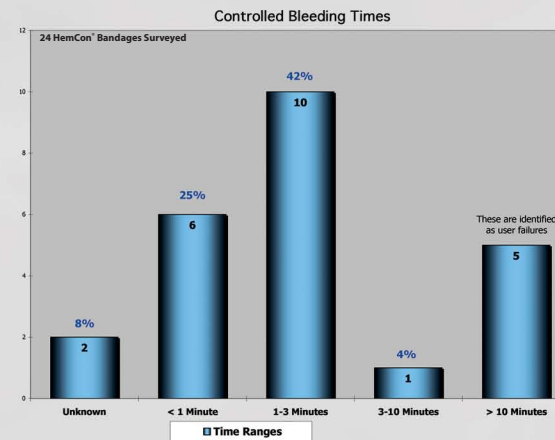
Introduction: The HemCon® Bandage is a hemostatic dressing made of chitosan, a natural substance that adheres when in contact with blood.

Hypothesis: The purpose of this study is to determine the effectiveness of the HemCon® bandage in a civilian EMS system.

Methods: The HemCon® Bandage was added to all apparatuses of a mixed urban-suburban fire agency in June of 2005. The agency provides first response ALS service to 400,000 and responded to over 24,000 EMS calls in 2004. All personnel were trained using multimedia presentations in the use of the HemCon® 4x4 Bandage. The dressing was to be used when conventional treatment (pressure and gauze dressings) failed or for obvious arterial bleeding. After each use, paramedics documented wound characteristics, bleeding type (venous or arterial), time to cessation of bleeding, and presence of subsequent bleeding. Outcome variables and patient demographics were abstracted and entered into an MS Access database. Descriptive analyses were performed.

Results: Data collection is ongoing, preliminary results are as follows. There have been 24 uses to date, 18 male and 6 female, ages ranging from 8 to 91 years. In 12 cases where direct pressure or gauze dressings failed to control bleeding, the bandage provided hemostasis without subsequent rebleeding within 3 minutes of application (in one case 5 minutes). The bandage was also effective in 3 cases where direct pressure had not been applied initially. Among the 17 successful applications, there were 7 scalp lacerations, 3 forehead lacerations, 2 arm lacerations, 4 leg lacerations and 1 chest laceration. In 5 of the 7 remaining cases, the HemCon® Bandage failed to stop bleeding within 10 minutes due to user error; in one case the incorrect side of the bandage was applied, in the second the bandage only partly covered a thigh laceration, in the third a scalp laceration was contaminated by cooking oil which prevented binding, in the fourth the bandage was placed on the surface rather than inserted into a deep thigh laceration, in a fifth case a medic forgot which side to apply to an axillary stab wound.

Conclusions: This limited experience suggests the HemCon® Bandage can be successfully incorporated into the civilian EMS system. When properly applied, the HemCon® Bandage stops uncontrolled external hemorrhage when conventional methods fail.



Shrimp Shells Shelve Shock?
The HemCon® Bandage contains chitosan, a substance derived from shrimp shells.



A Life-Saving Attraction?

The positively charged chitosan molecules attract negatively charged red blood cells. As the cells are pulled into the bandage, they create a tight-fitting plug over the wound.



Illustration by Jason Lee, for Popular Science

Bandage Boasts Bonus Bacteria Barrier!

While this is not as important in the urban/suburban setting, it is particularly beneficial when definitive care is delayed. "HemCon chitosan dressing adheres well to tissue and has rapid antimicrobial action."*



Images of mouse wounds infected with *P. mirabilis* and treated with HemCon or alginate dressing. HemCon adheres better to mouse wounds. Some alginate dressings detach after 24 hours.

* Investigation Of The Topical Antimicrobial Efficacy Of The Battlefield HemCon® Bandage Against Wound Sepsis In A Mouse Model
Hamblin, MR; Tegos, GP; McGrath, B; Kimball, J; McCarthy, S

HemCon ID	Coagulopathies	Type Of Bleed	Wound Location	Wound Size	Wound Shape	Wound Cause	Pretreat	Type	HemCon Application Type	Post-HemCon Bleeding	Bleeding Time	Post-HemCon Bleeding Type	Satisfaction	Comments on Product Improvement and Issues	Gender	Age
1	No	Venous	Left Bicep	1 In	Linear	Knife	Yes	Direct Pressure	Whole 4x4	Unknown	< 1 Minute		10		Male	29
2	No	Unknown	Left Anterior Forearm	3 In	Linear	Knife	Yes	Direct Pressure	Whole 4x4	Yes	1-3 Minutes	Oozing	9	1 - Unsure if it was ok to fold the dressing and insert in the wound; 2 - Relative lack of flexibility of dressing, would be more useful if more malleable	Male	38
3	No	Unknown	Left Thigh Anterior Thigh	3 In	Linear	Grinder	Yes	Direct Pressure	Cut to Smaller Pieces	Yes	> 10 Minutes	Where The HemCon® Bandage Did Not Cover The Wound	8	User felt he applied the dressing incorrectly and thus the bleeding did not stop	Male	45
4	Yes	Arterial	Scalp/Vertex	3 In	Linear	Fall	Yes	Towel	Whole 4x4	Unknown	1-3 Minutes		8		Male	85
5	Unknown	Arterial	Scalp-Frontal	8 In	Linear	Fall	Yes	Towel	Cut to Smaller Pieces	No	1-3 Minutes		10		Male	61
6	Unknown	Unknown	Right Eye Brow	2 In	Linear	Fall	Yes	Direct Pressure	Whole 4x4	Yes	> 10 Minutes		0	Product was not applied to the wound properly - medic was unsure of which side was to go to wound	Male	UNK
7	Yes	Arterial	Scalp-Frontal	1.5 In	Linear	Fall	Yes	Direct Pressure	Whole 4x4	Unknown	1-3 Minutes		8		Female	91
8	Unknown	Venous	Scalp-Occiput	6 In	Avulsion	MVC	Yes	Direct Pressure	Whole 4x4	Yes	> 10 Minutes	Bandage Unable to Bond to Oil-Soaked Hair	2	Bandage difficult to see when covered in blood and in the dark	Male	63
9	No	Unknown	Chest-Left	2 Cm	Stabbing/Puncture	Knife	Yes	Direct Pressure	Cut to Smaller Pieces	No	< 1 Minute		9	Bandage did not adhere very well due to minimal blood at laceration	Male	49
10	Unknown	Arterial	Forehead-Left	2 In	Linear	Knife or Bumper of Automobile	No	0	Cut to Smaller Pieces	No	< 1 Minute		10		Male	35
11	No	Arterial	Scalp-Frontal	1-2 In	Linear	Object	Yes	Direct Pressure	Whole 4x4	No	1-3 Minutes		9		Male	60
12	No	Arterial	Thigh	2 In	Stabbing/Puncture	Knife	Yes	Direct Pressure	Cut to Smaller Pieces	Yes	> 10 Minutes	Wound Continued to Bleed from Deep in the Puncture	1	Bandage unable to be placed deep inside the wound site where the bleeding was coming from	Male	32
13	Yes	Venous	Scalp-Occiput	2 Cm	Linear	Fall	Yes	Direct Pressure	Cut to Smaller Pieces	Unknown	Unknown		8		Female	76
14	No	Venous	Forehead	1.5 In	Linear	MVC	Yes	Direct Pressure	Cut to Smaller Pieces	Unknown	< 1 Minute		10		Female	21
15	No	Venous	Knee Amputation Site	Torn Stitch	Linear	Fall	No	0	Whole 4x4	Yes	5-10 Minutes		6	Should have cut the bandage to fit wound better	Male	59
16	Yes	Venous	Forehead	Quarter Size	Round	Fall	Yes	Direct Pressure	Cut to Smaller Pieces	Yes	1-3 Minutes	Oozing	6	Did not adhere to wound well	Female	85
17	Unknown	Venous	Neck	3x3-8 In Ea	Linear	Electric Saw	No	0	More Than One Dressing	Yes	1-3 Minutes	Oozing	4		Male	38
18	Unknown	Venous	Facial	4x2 In Ea	Linear	Struck by Car	Yes	Direct Pressure	Cut to Smaller Pieces	Yes	1-3 Minutes	Bleeding Where HemCon Didn't Cover	7	Difficult to shape around facial features	Male	21
19	Yes	Venous	Left Thigh	5x5 In	Irregular	Broken Hematoma	Yes	Direct Pressure	Whole 4x4	No	1-3 Minutes		10		Female	62
20	No	Venous	Scalp	8 Cm	Linear	Fall	Yes	Direct Pressure	Whole 4x4	Unknown	Unknown		0	Unknown outcome	Male	8
21	No	Arterial	Axilla	1 In	Stabbing	Knife	Yes	Direct Pressure	Whole 4x4	Yes	> 10 Minutes	Bleeding Continued	2	Forgot what side was up, unclear if correct side was applied to wound	Male	46
22	No	Venous	Shin Varicose Vein	0.5 In	Nick to Varicose Vein	Fingernail	Yes	Direct Pressure	Cut to Smaller Pieces	Unknown	1-3 Minutes		0	Unclear which side went to wound	Male	69
23	No	Arterial	Wrist	7 In	Linear	Knife	No	0	Whole 4x4	No	< 1 Minute		10	Unclear which side went to wound	Female	16
24	Unknown	Unknown	Scalp	2 In	Linear	MVA	No	0	Whole 4x4	No	< 1 Minute		10		Male	26

Conclusion:

Failures identified fell into two main areas, both related to user error. First there was confusion with which side is applied to the patient. Secondly, the application requires that the bandage be placed directly into a wound at the source of the bleeding. This process afforded the opportunity to feed directly back to the manufacturer.

HemCon responded by making the bandage more malleable, making it easier to properly place the bandage at the source of bleeding. Additionally, they placed printed "This Side Up" backings on one side of the bandage with print that can be easily be read in day light or with night vision goggles.

The project created a symbiotic relationship, in which the fire agency was able to identify training shortcomings and HemCon was able to make improvements to their product. The product improvements will benefit troops on the battlefield.

From the Battlefield to the Street. From the Street to the Battlefield.

