

Zeolite Dressing Bag in Trauma for Hemorrhage Control: Case of 90 Patients Used

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Abstract. Objective: Uncontrolled hemorrhage and its direct consequences remains the leading cause of trauma-related death. The most popular one is QuikClot, however, it also exists severe security hidden danger, indicating that there is no ideal protective equipment yet. This study aimed to evaluate the efficacy and safety of Zeolite Dressing in Trauma for Hemorrhage Control. Methods: Emergency doctors used Zeolite Dressing Bag(s) to stop bleeding in a series of wound bleeding which was at least deep into the muscular layer and need to be sutured operation. The number of layers of gauze wetting, wound size, temperature changes near the wound, skin irritation, allergic reaction and local rejection were recorded were recorded. Results: There were 90 patients which were used Zeolite Dressing Bag(s) to stop bleeding in emergency center in hospital. The Effective hemostasis of Zeolite Dressing Bag was 87.36% in 60th seconds,96.55% in 120th seconds and 100% in 180th seconds. There was no skin irritation, no allergic reaction and no local rejection during the clinical trial. There was no abnormal tissue in the hemostatic site after thrombus debridement, and there was no burn in the wound. The wound healed well during the suture removal period.

Keywords:Zeolite Dressing;Exothermic;Hemostatic;Effective hemostasis

1. Introduction

Traumatic injury is a common cause of death and disability, in which approximately 40% of trauma-related deaths are due to bleeding or its consequences[1]. Despite great advances in medical management and protective device, there is no single ideal protective equipment for the field treatment of hemorrhage yet, and uncontrolled bleeding remains one of the most challenging problems in emergency medicine[2].An ideal hemostatic device for the first aid treatment requires the following conditions to be satisfied[3]: First, it can be applied to different types and degrees of wounds, with the ability to stop bleeding in a very short time (Effectiveness); Second, it should pose no danger to the tissue to which it is applied, and not increase the risk of inflammation and infection (Safety); Third, it should be simple and easy to use, both for medical workers and those with limited first aid training (Simplicity);It has been proven theoretically and practically that several medical dressings are effective in stopping bleeding[4], however, each of which has its benefits and drawbacks[3]. The most popular ones among them are the procoagulant Chitosan-Based Bandage (HemCon [HC], Tricol Biomedical Inc.) and Zeolite Powder Dressing (QuikClot [QC], Z-Medica Corporation)[5-9]. As a convenient user friendly hemostatic bandage able to effectively control bleeding for various kinds of wounds and also offer a physical antibacterial barrier, HemCon works largely through tissue adherence as well as mechanical isolation and protection for the injury[3,8,10]. QuikClot is a granular zeolite powder which can selectively absorb various gases and liquids, and of course water in the blood, thereby the platelets, erythrocytes and clotting factors are concentrated, so as to play a role in hemostasis[11]. Yet there is a strong exothermic reaction resulting from the combination of QuikClot and blood, which may produce severe thermal tissue injury and consequently limit its application[11,12]. Therefore, we were encouraged to develop a new-type bagged Zeolite Dressing Bag.We evaluated the efficacy and safety of Zeolite Dressing Bag(s) to stop bleeding.

2. Methods

There was one or more bleeding external trauma which was deep into the muscular layer and need to be sutured. Clean the wound, Zeolite Dressing Bag was manual pressure applied to point on trauma. and then 16 layers standard gauze was covered on Zeolite Dressing Bag at once, apply pressure directly for 3 minutes. Recorded wound size, the number of layers of blood infiltrating standard gauze and temperature changes near the wound at 60s,120s,180s,removed Zeolite Dressing Bag, cleaned and sutured wound. Clinical follow-up recorded wound burn, skin irritation, allergic reaction and local rejection during the clinical trial.

3. Results

There were 90 bleeding external trauma patients (72men, 18women) took part into clinical trial in emergency center. The location of bleeding wound of Zeolite Dressing Bag application, All bleeding trauma are external. The size of wound seem in Table 1.

Table 1 wound size

	Size /cm
Wound length	5.52±3.27
Wound depth	1.42±0.88

Emergency doctor used Zeolite Dressing Bag to control bleeding, the Effective hemostasis of Zeolite Dressing Bag was 87.36% in 60th seconds,96.55% in 120th seconds and 100% in 180th seconds. Zeolite Dressing Bag was applied to control the bleeding to allow surgeons are able to complete operations quickly, The temperature change near the wound is less than 10 degrees celsius in hemostasis process, the wound was not burned. In the time of remove stitches, all patients cured well, the levels of blood routine, coagulation index changed all in normal range. no skin irritation, no allergic reaction and no local rejection during the clinical trial.The wound healed well during the suture removal period.

4. Discussion

Zeolite Dressing Bag is used to control traumatic bleeding in prehospital, easy to use. Excellent hemostatic effect and short hemostatic time, Surgeons are able to complete operations quickly in hospital. the wound was not burned in hemostasis process. Zeolite Dressing Bag absorbs water and releases heat without burning tissue,the temperature change near the wound is less than 10 degrees celsius in hemostasis process, which is conducive to wound healing and rehabilitation, and is also convenient for debridement.It is significantly different from the reported QuikClot to stop bleeding, severe fever, burn tissue and difficult debridement, in wounds reach up to 70°C, burns and damage to tissue[13-17]. Although this process generates heat, but Zeolite adsorption process wound temperature was mild, did not burn tissue,without severe pain and discomfort. In the time of remove stitches, all patients cured well, the levels of blood routine, coagulation index changed all in normal range. no skin irritation, no allergic reaction and no local rejection during the clinical trial.

Interestingly, packaging the zeolite granules in fabric bags, without any change in chemical composition, could effectively eliminate the heat damage of tissue and maintain the integrity of zeolite granules on the basis of keeping a good hemostasis effect. Based on the Clinical Trials results, we can draw a conclusion that Zeolite Dressing have a commensurate power to stop bleeding, hence it might be a viable alternative for treating severe hemorrhage.

5. Conclsions

Zeolite Dressing Bag could exhibit a strong hemostatic effect, and no adverse reactions was found after the treatment of Zeolite Dressing. However, Zeolite Dressing is safer in dealing with traumatic uncontrolled hemorrhage compared with QuikClot.

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