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Subj: ABSTRACT RESULTS FOR COMPARISON OF CELOX, HEMCON AND  
QUIKCLOT IN A LETHAL HEMORRHAGIC GROIN INJURY

1. This memo includes a brief summary of our collaborative study (CRADA 06-068).
2. **Background:** Uncontrolled hemorrhage remains a leading cause of traumatic death in both the military and civilian setting. Several topical adjunct agents have been shown to be effective in controlling hemorrhage in various pre-clinical trials and two, HemCon and QuikClot, are being utilized regularly on the battlefield. However, recent literature reviews have concluded that, as of yet, there is no ideal topical agent for controlling lethal hemorrhage. Newly developed products that may overcome current shortcomings need further evaluation.
3. **Objective:** To compare a new hemostatic product, Celox, to HemCon and QuikClot in terms of re-bleed and survival in lethal hemorrhagic groin injury.
4. **Methods:** A complex groin injury with complete transection of the femoral vessels and 3 minutes of uncontrolled hemorrhage was created in 48 swine (35.5 +/- 2.5 kg). The animals were then randomized to 4 treatment groups (12 animals each). Group 1 included Standard gauze Dressing (SD); group 2, Celox granules (C); group 3, HemCon standard dressing (HC); and group 4, QuikClot granules (QC). Each agent was applied directly to the injury according to the manufacturer's directions with 5 minutes of manual pressure followed by a standard field compression dressing. Hextend (500 mL over 30 minutes) was infused to complete resuscitation. Hemodynamic values were recorded every 15 minutes over 180 minutes. Primary endpoints included re-bleed and death. Additionally, amount of hemorrhage and peak mean arterial pressures were recorded.
5. **Results:** All four groups achieved the same degree of shock (58% to 61% blood loss;  $p = 0.761$ ) and peak resuscitation mean arterial pressure greater than 60 mm Hg ( $p = 0.298$ ). Celox reduced re-bleeding to 0% ( $p < 0.001$ ), HemCon to 33% ( $p = 0.038$ ), and QuikClot to 8% ( $p = 0.001$ ), compared to Standard Dressing (83%). Celox improved survival to 100% ( $p = 0.018$ ) compared to Standard Dressing (50%). Survival for HemCon 67% ( $p = 0.679$ ) and QuikClot 92% ( $p = 0.072$ ) did not differ from Standard Dressing (50%). There were marginally significant differences among hemostatic agents in rebleeding ( $p = .049$ ) and survival ( $p = .049$ ).
6. **Conclusion:** Celox was at least as effective as HemCon and QuikClot in controlling hemorrhage. Although all three agents were superior to Standard Dressing with regard to re-bleed, only Celox improved survival in a lethal hemorrhagic groin injury compared to Standard Dressing.
7. Should you have any further questions, please feel free to contact me via phone (757.953.1382) or email ([buddy.kozen@med.navy.mil](mailto:buddy.kozen@med.navy.mil)).

  
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