Extending the Golden Hour of Hemorrhagic Shock Tolerance in Rats

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Protecting vital organs during hemorrhagic shock (HS) may extend survival time during untreated lethal HS, and increase survival rate after all-out resuscitation from HS, by preventing delayed multiple organ failure. We have pursued these hypotheses in rat models since 1990. Using a volume controlled HS model with hemorrhage rate of 3.25 ml/100g, moderate hypothermia or 100% oxygen breathing extended survival time and rate. Changing from breathing of air to 100% oxygen increased meant arterial blood pressure (MAP).

Using a new, three-phased outcome model of uncontrolled HS (UHS) (Phase 1) of 90 minutes (min.) (with tail amputation), hemostasis and all-out fluid resuscitation (FR) (Phase II), and observation to 72 h (Phase III), the survival rate was greater with minimal hypotensive FR (MAP 40 mmHg) by lactated Ringer's solution (LR) during UHS, as compared to no FR or normotensive FR with LR. Using the same resuscitation-outcome model, survival times and rates were greater when UHS was under moderate hypothermia (Hth) (30° C), and greatest with Hth plus minimal hypotensive FR.

In a preliminary study using the above UHS model phase I only (lethal UHS), survival time was about 1 h under normothermia and 2 h under moderate Hth, with a slight increase in survival time by 100% O_2 breathing. Visceral ischemia, monitored in terms of tissue PCO_2 rise, seemed less under 100% O_2 breathing.

In a definitive study of lethal UHS, in 9 groups X 6 (total 54) rats, mean survival time was 164 min. under moderate Hth plus 50% O_2, 134 min. under mild Hth (34° C) and 50% O_2 (NS); as compared to 51 min. under normothermia and air breathing (p <0.05). Mild Hth is easier to induce and safer than is moderate Hth. Survival time compared to air breathing was slightly increased (NS) not only with 100% O_2 but also with 50% O_2 which is more readily available in the field than is 100% O_2. Survival time was longest with 50% O_2 plus 30° C. Visceral ischemia during UHS caused intestinal and liver surface PCO_2 to increase from about 50 to 70 mmHg baseline to over 200 mmHg before death, with lower values for a longer time under 30° C or 34° C compared to 38° C (NS), and lesser increase during HS under 50% O_2 compared to air breathing (p <0.05).

Protective mild Hth during prolonged HS (with avoidance of shivering by insult or sedation) should be considered for clinical feasibility trials. A possible benefit from oxygen breathing in the field, which presents logistic obstacles in mass disasters or for military combat casualties, needs outcome studies.

Key Words: fluid resuscitation; hemorrhagic shock; hyperoxia; hypothermia; uncontrolled hemorrhage

Capillarity in Burn and Wound Dressing

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This technique for burn and wound dressing was developed during the past 20 years. It utilizes the theory of capillarity. Its use and application has generated considerable interest. It maintains a proper balance between humidity and absorption with a predetermined absorption capacity. The dressing is built up in four layers: 1) a non-adherent, oil-in-water impregnated viscose fabric product as the contact layer; 2) a non-woven swab made from viscose in a filamented form; 3) a non-occlusive material which allows free passage of gases; and 4) a gauze bandage or a light plaster cast. The first two layers are moistened with sterile, normal saline, and are applied on top of the contact dressing. The second layer exerts high capillarity and actively draws the secretions away from the contact layer, thus preventing pooling and maceration. The third layer is a hydrophobic material and, as such, does not become stained or impregnated with discharges while it controls the evaporative process from the wound surface.

This dressing is sterile and non-toxic. It allows air permeability with a non-adherent surface. Its thermal insulation results in high mitotic activity with rapid epithelialisation and improved granulation. It is impermeable to airborne micro-organisms with no passage of exudate from wound to surface. It also is free from particle and toxic wound contaminants.

The dressing is easily removable without causing pain to the patient. It should remain untouched for seven to ten days until healing is complete. It is simple to use, readily available, quickly applied, and in most cases, the patient can be discharged to home, thus effecting a huge saving in hospital bed occupancy, medical time, and material.

Key Words: burns; capillarity; dressings; epithelialization; healing

Session 3A: Hospitals and Disaster

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Experience of the Utrecht Emergency Hospital in Admission and Treatment of Groups of Victims in the Period 1991–1996

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The admission and treatment of large groups of patients or victims of mass casualties differ considerably from daily routine in any emergency department. For such situations, a clear disaster relief plan, well-trained personnel, experienced coordinating staff members, communication facilities, accurate patient administration, and possibilities to enlarge admission capacity are necessary.