CHANGES IN MESENTERIC BLOOD FLOW AFFECT TRANSLOCATION IN SHEEP

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Introduction:
Mortality in severely burned patients due to secondary infection remains high (Mason et al. 1986) despite the fact that antibiotics and aggressive monitoring and surgical practices have improved outcome (Herndon et al. 1986 and Thompson et al. 1986). The large population of bacteria in the gut has been considered to be a source of infection since Ford described their presence in the extraintestinal abdominal viscera (Ford 1900 and 1901). More recently, the gut has been postulated as the source of infections in patients with hematological malignancies (Tancrede et al, 1985) and of bacteremia in trauma patients with hemorrhagic shock (Rush et al. 1988). Bacterial translocation from the gastrointestinal tract following or during thermal injury (Deitch et al. 1986 and Maejima et al. 1984), traumatic shock (Deitch et al. 1987), endotoxemia (Deitch et al. 1987a and Deitch et al. 1987b), hemorrhagic shock or intestinal bacterial overgrowth (Berg et al. 1981 and Deitch et al. 1985) has been demonstrated in the small animal model. In this laboratory, we have developed a chronic sheep model for the study of bacterial translocation examining the relationship of changes in mesenteric blood flow and the extent of translocation of bacteria from the gut. A series of experiments was performed in awake, resuscitated sheep to determine the effect of thermal injury, inhalation injury and combined inhalation and thermal injury on mesenteric arterial blood flow and bacterial translocation from the gut. After determination of these effects, further experiments were
performed to examine the effect of mechanically decreasing mesenteric blood flow in the absence of any other injury or of maintaining mesenteric blood flow with selective mesenteric arterial infusion of sodium nitroprusside in the presence of cutaneous thermal injury.

Methods:

Animal preparation. A Swan-Ganz thermal dilution catheter (Model 93A-131-7F, American Edwards Laboratories, Inc., Anasco, Puerto Rico) was percutaneously positioned in the pulmonary artery via the right jugular vein and cut-down catheters (18G, 36in, Parke Davis, Sandy, Utah) were placed in the right femoral artery and vein under direct vision for continuous monitoring of blood pressure and venous access. Through a left subcostal flank incision, the aorta was approached in an extraperitoneal fashion. The origin of the cephalic mesenteric artery (CMA) was identified and a transit-time ultrasonic flow probe (T-101, Transonic Systems Inc., Ithaca, New York) placed on the CMA at its origin. An inflatable 8 mm vascular occluder (Model OC8A, Invivo Metric Systems, Healdsburgh, California) was placed proximal to the flow probe to allow mechanical reduction of CMA blood flow. For selective infusion of sodium nitroprusside into the CMA, a 2 1/2 in. 18 G Teflon catheter (American Pharmaseal Corp., Valencia, California) was transaortically positioned in the proximal CMA. A major intestinal lymphatic was identified in the root of the mesentery adjacent to the cephalic mesenteric vein, and a Silastic catheter (I.D. 0.025 in., Dow Corning Corp, Midland, Michigan) was inserted and secured to create an intestinal lymphatic fistula. Sheep were allowed five days after surgery to recover before entry into an experimental protocol.

Measurements. Aortic, pulmonary arterial and pulmonary artery wedge pressures were measured using strain transducers (P23id Statham-Gould, Oxnard, California) connected to a multichannel recorder (Model OM-9, Electronics for Medicine, Honeywell, Minneapolis, Minnesota). Cardiac output was determined using a thermal dilution cardiac output computer (Model 9520, American Edwards Labs, Irvine, California). Intestinal lymph flow was collected in heparinized graduated tubes over timed intervals for flow measurements. Protein concentration in