Introduction. A recent addition to the surgical management of second and third degree thermal injury is early tangential excision of the burned wound. This procedure results in profuse and extremely rapid blood loss with rates of hemorrhage as high as 200 cc per minute. One step in limiting the hemorrhage has been the application to the excised area of dressings soaked with a 1:10,000 epinephrine solution. Occasionally, arrhythmias, hypertension and tachycardia have been noted following application of these dressings. Since the amount of epinephrine absorbed might vary with the area of excision covered, the nature of the wound after excision (dermis, fat, fascia) and is therefore unpredictable, we were curious to know how high epinephrine levels would become in these hypermetabolic burned patients who already tend to have high circulating catecholamine levels. The object of this study was to examine, in burned patients, the effect of the application of epinephrine soaked dressings applied to excised burn wounds on plasma epinephrine levels.

Method. Patients with second and third degree thermal injury of greater than 25% Total Body Surface Area (TBSA) were included in the study which conformed to standards of the Human Subjects Review Committee. Patients were anesthetized with three different techniques: enflurane IMAC/0.05 air, pancuronium, ketamine (2 mg/kg IV induction and 2 mg/min IV)/0.25-air/pancuronium and fentanyl (12 μg/kg)/N2O-0.25/pancuronium. All patients were mechanically ventilated. Arterial blood samples were obtained pre-anesthesia, post-induction, at intervals during the procedure, and in the recovery room. Blood samples were placed in tubes containing EDTA and sodium bisulphite, immediately placed in ice, quickly centrifuged, and the sample of plasma frozen at -80°C for future catecholamine analysis.

Epinephrine and norepinephrine levels were determined by high performance liquid chromatography using an electrochemical detector.

Results. All patients so far studied have shown at least a tenfold increase in epinephrine levels following the application of epinephrine soaked dressings as compared to pre-application levels (Table 1). In addition, the elevated levels have been sustained after the removal of the epinephrine soaked dressings suggesting that epinephrine was taken up by the tissue and released from this depot for at least one hour following removal of the dressings. Also measured were norepinephrine levels which reflect endogenous catecholamine levels.

Discussion. The levels of epinephrine observed in patients treated with the application of epinephrine soaked dressings are much greater than those observed by Brown et al (1) in patients who underwent elective intra-abdominal surgery. Levels of epinephrine during various activities and pathologic states as summarized by Cryer (2) are also exceeded in the study patients. Subjects given graded epinephrine infusions showed an increased heart rate at epinephrine levels of 50-100 pg/ml; hyperglycemia, ketogenesis, and glycolysis at 150-200 pg/ml; and suppression of insulin secretion at levels greater than 400 pg/ml as summarized by Cryer (2). Although the consequences of these levels in hypermetabolic burn patients are not known, metabolic derangement from exogenous catecholamines may be deleterious. Of more immediate concern is the use of halothane in patients with very high circulating catecholamines. We feel that preliminary data suggest significant systemic absorption of epinephrine and that this should be borne in mind when selecting an anesthetic technique for burned patients who will receive application of epinephrine soaked dressings to excised areas.

References.
1. Brown FF, III, Owens WD, Felts JA, Spitznagel EL Jr., Cryer PE: Plasma epinephrine and norepinephrine levels during anesthesia: enflurane-N2O-0.2 compared with fentanyl-N2O-0.2. Anesthesiology 63:366-370, 1982

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