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Title : EPINEPHRINE LEVELS PRE AND POST APPLICATION OF TOPICAL EPINEPHRINE DURING BURN SURGERY

Authors : R.M. Timonen, M.D., E.G. Pavlin, M.D., R.H. Haschke, Ph.D., and D.M. Heimbach, M.D.

Affiliation : Departments of Anesthesiology and Surgery, University of Washington School of Medicine, Seattle, Washington 98195

Introduction. A recent addition to the surgical management of second and third degree thermal injury is early tangential excision of the burn wound. This procedure results in profuse and extremely rapid blood loss with rates of bleeding 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)/O_2-air/pancuronium, ketamine (2 mg/kg IV induction and 2 mg/min IV)/O_2-air/pancuronium and fentanyl (12 µg/kg)/N_2O-O_2/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 cold 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.

TABLE 1

Time	Patient 1		Patient 2		Patient 3		Patient 4	
	NorEpi Pg/ml	Epi pg/ml	NorEpi Pg/ml	Epi pg/ml	NorEpi Pg/ml	Epi pg/ml	NorEpi Pg/ml	Epi pg/ml
pre-anesth.	1025	323	795	280	897	146	1111	343
post-induct.	595	184	1227	82	752	69	1026	1898
post-incision	790	202			695	68	1254	668
(% TBSA excised)		(10)				(4)		(10)
Post epi 5'	845	2052			623	1406	1417	1272
(% TBSA covered)		(10)				(9)		(10)
Post epi 10'			984	585	540	1062	1237	2504
(% TBSA covered)				(12)		(9)		(10)
post epi 15'			707	2906	550	2674		
(% TBSA covered)				(12)		(9)		
post epi 30'			442	6496				
(% TBSA covered)				(12)				
post removal epi 15'	745	4337	450	7653	366	1778	1072	3976
Recovery Room	1416	2906	734	3256	1462	1252	1949	4688

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 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 show 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, Spitznagal EL Jr., Cryer PE: Plasma epinephrine and norepinephrine levels during anesthesia: enflurane-N_2O-O_2 compared with fentanyl-N_2O-O_2. Anesth Analg 61:366-370, 1982

2. Cryer PE: Physiology and pathophysiology of the human sympathoadrenal neuroendocrine system. N Engl J Med 303:436-444, 1980

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