

Title: THE HEMODYNAMIC EFFECTS OF EXTUBATION IN POSTOPERATIVE CRITICAL CARE PATIENTS

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Objective. Extubation during emergence from anesthesia may cause tachycardia and hypertension. In the postoperative critical care patient it is a common, but unsubstantiated view, that extubation often decreases blood pressure and pulse rate by relieving the sympathetic stimulation from the endotracheal tube. To determine the cardiopulmonary effects of extubation in the postoperatively ventilated patient, we recorded hemodynamic parameters and respiratory rate in a series of patients prior to, during and after extubation.

Method. Fifty-two patients were studied following cardiac surgery over a six month period. Forty-four patients had coronary artery bypass grafts, six valvular surgery and two repair of ventricular septal defects. Three were children. Extubation was usually performed from continuous positive airway pressure (CPAP) of 5 cm H₂O after completion of an intermittent mandatory ventilation wean. Vital capacities were greater than 10 ml/kg, inspiratory force greater than -30 cm H₂O and arterial pCO₂ were less than 45 mmHg.

The Hewlett Packard 78720A Arrhythmia Monitoring System was used to record extubation time and print out trends in heart rate, respiratory rate, systemic blood pressure, pulmonary artery pressures, central venous pressure and premature ventricular beats with samples taken every 10 seconds. Recordings were made to include extubation and a minimum of 90 minutes post extubation. All of the parameters were not recorded in every patient.

Results. Two patients (4%) required reintubation within 24 hours post-extubation -- one within two hours. Mean arterial pressure (MAP) increased ≥ 10 mmHg in 67% of patients extubated. Increases in this range were more prevalent in the systolic (87%) than the diastolic (52%) component. MAP decreased in 4% of patients. Pulmonary artery pressures were monitored in 90% of patients. Mean pulmonary artery pressure (PAP) increased ≥ 5 mmHg in 49% of those extubated with 45% of patients exhibiting diastolic (PADP) changes of this magnitude. Central venous pressure (CVP) increased ≥ 5 mmHg in 51% of patients. Thirteen percent of patients were paced by temporary cardiac pacemakers. Of those not paced, heart rate (HR) increased ≥ 5 beats per minute in 55% of those extubated and decreased below pre-extubation rate in only 4% of patients. Respiratory rate increased ≥ 5 breaths per minute in 67% of patients after extubation. Ventricular premature beats (VPB's) increased in frequency in 26% of patients, with 8% of patient increasing VPB's by ≥ 5 beats per minute. There was no evidence of ischemia in EKG lead II. In a large percentage of patients peak changes occurred > 5 minutes post-extubation in all parameters: MAP (42%), PAP (45%), CVP (29%) and HR (22%). It required ≥ 10 minutes for values to return to baseline in many patients: MAP (44%), PAP (49%), CVP (33%), HR (33%) and RR (33%).

Conclusion. The prevailing opinion in our institution was that the presence of an endotracheal tube was an irritant causing hemodynamic instability and increased sympathetic drive in the postoperative, ventilated patient. In most of our patients, extubation actually increased heart rate and respiratory rate as well as systemic and pulmonary pressures. The changes recorded often do not occur immediately with the physical stimulation of extubation but in many cases at least 5 minutes after extubation. The changes, though usually transient, do last > 10 minutes in many patients. A prolonged effect of the physical stimulation, transient hypercarbia/hypoxia or increase in venous return when positive airway pressure is removed may be involved. Whether the changes can be predicted in certain patient populations and whether the changes are associated with morbidity will depend upon the delineation of the cause. In summary, extubation appears to be a stimulating and possibly stressful procedure.

