**Title:** THE HEMODYNAMIC RESPONSE TO KETAMINE IN PATIENTS WITH PERICARDIAL TAMPONADE

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**INTRODUCTION:** Ketamine has been advocated as an induction agent in conditions of compromised circulation. From a pharmacologic viewpoint, it has been considered the agent of choice for anesthetic induction associated with the operative relief of pericardial tamponade.[1] In this study, hemodynamic effects of ketamine were measured in patients undergoing operative relief of pericardial tamponade.

**METHODS:** This study was approved by the Institutional Review Board and informed consents were obtained. Eleven patients with echocardiographically documented pericardial effusion with clinical signs of pericardial tamponade were prospectively studied. Intravenous, radial and pulmonary arterial catheters were inserted using local anesthesia. Circulatory variables were measured before anesthesia induction (Stage I), five minutes following the injection of ketamine, 2 mg/kg i.v. (Stage II), and five minutes after pericardial decompression (Stage III). Following Stage II, tracheal intubation was facilitated by succinylcholine, ventilation was controlled and anesthesia supplemented with nitrous oxide. Pancuronium bromide was utilized for skeletal muscle relaxation.

**RESULTS:** (Table) There was considerable variability in the baseline hemodynamic values, and the cardiovascular response to ketamine was likewise variable. Following the injection of ketamine, cardiac index (CI) decreased in 7 patients and increased in 4. Mean arterial pressure (MAP) increased in 8, right atrial pressure increased in 7, pulmonary artery occluded pressure (PAOP) increased in 4, decreased in 5, and was unchanged in the remaining 2 patients. In 9 patients, baseline PAOP exceeded 15 torr (26.0 ± 2.45). Ketamine anesthesia was accompanied by a decrease in CI in 7 of the 9 (from 3.39 ± 0.62 l/min/$m^2$ to 2.78 ± 0.50 l/min/$m^2$). Cardiac index increased or remained unchanged in only 2 patients with PAOP above 15 torr and in 2 patients with PAOP below 15 torr (Fig.)

**DISCUSSION:** This group of patients exemplifies the considerable heterogeneity seen in patients who may require operative treatment for pericardial tamponade. The variability in response to ketamine was apparently related to different degrees of cardiovascular compromise from both the tamponade and underlying cardiovascular disease in these 11 patients. In this circumstance, any decrease in cardiac index should be considered detrimental and potentially responsible for decreased perfusion, which at times could be dramatic. While no drug presently available offers as many advantages as ketamine for the induction of anesthesia in pericardial tamponade, it should be stressed that the response to this intervention may be highly variable, and when the PAOP exceeds 15 torr, the most likely response is a decrease in cardiac index which may be accompanied by either increased or decreased MAP. Caution should be exercised when this drug is utilized, and preparations and personnel should be readily available to immediately relieve the tamponade should hypoperfusion result.

**REFERENCES:**

1. Kaplan JA, Bland JW, Dunbar RW: The perioperative management of pericardial tamponade. South Med J 69:417-419, 1976

**TABLE: HEMODYNAMIC RESPONSE TO KETAMINE IN PATIENTS WITH PERICARDIAL TAMPONADE**

| VAR | STAGE I | STAGE II | STAGE III |
|---|---|---|---|
| HR | 108 ± 6.5 | 112 ± 8.0 | 107 ± 5.9 |
| MAP | 99 ± 7.3 | 114 ± 8.9* | 100 ± 5.9 |
| RAP | 17 ± 2.2 | 19 ± 1.7 | 15 ± 1.3 |
| PAOP | 23 ± 2.3 | 24 ± 2.8 | 23 ± 2.7 |
| CI | 3.23 ± 0.42 | 3.03 ± 0.40 | 3.44 ± 0.44 |
| LVSWI | 32.9 ± 5.3 | 35.0 ± 6.9 | 35.6 ± 6.1 |
| SVRI | 1619 ± 317.8 | 2076 ± 446.9* | 1696 ± 367.7 |

Where VAR = variables, HR = heart rate (beats per minute), MAP = mean arterial pressure (torr), RAP = right atrial pressure (torr), PAOP = pulmonary artery occluded pressure (torr), CI = cardiac index (l/min/$m^2$), LVSWI = left ventricular stroke work index (gmm/$m^2$), SVRI = systemic vascular resistance index (dynes·sec·$cm^{-5}$/$m^2$).
Stage I - preinduction
Stage II - following ketamine
Stage III - following pericardial decompression
* $p < 0.05$ compared with baseline values

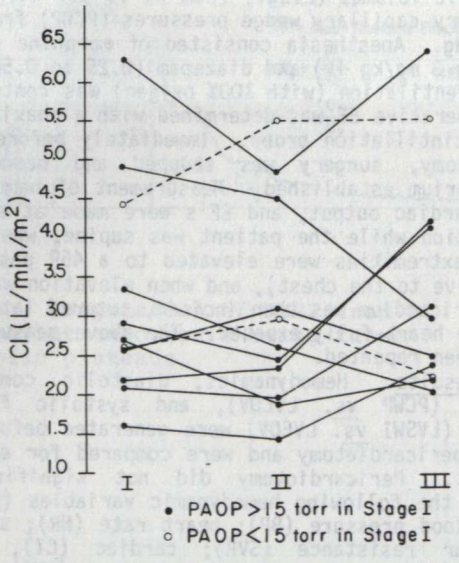


Fig. Effects of ketamine and pericardial decompression on the cardiac index (CI) in eleven patients with pericardial tamponade.