Introduction: Tamponade creates a tenuous hemodynamic state. Adequate preload, heart rate, and sinus rhythm are necessary whereas elevated afterload or positive pressure ventilation can cause cardiovascular collapse. We present a case where these hemodynamic goals were compromised by severe cardiomyopathy and potential for malignant hyperthermia.

Case Presentation: A 48 yr old male with symptomatic paroxysmal atrial fibrillation status post multiple cardioversions presented for subxiphoid pericardial window for a moderately large posterior pericardial effusion. His medical history included protein S deficiency resulting in large myocardial infarction and ejection fraction of 11%; paroxysmal ventricular tachycardia with placement biventricular internal cardiac defibrillator; and seizure disorder. His sister has malignant hyperthermia. Local anesthesia monitored care was offered but declined due to anxiety. After placement of a radial arterial line, the patient was induced with ketamine 1mg/kg and midazolam 0.1mg/kg and maintained on nitrous oxide/oxygen mixture, remifentanil 0.05mcg/kg/min, and intermittent ketamine boluses. Intraoperative TEE demonstrated severely dilated left ventricle, poor ventricular function and pericardial fluid. 1300cc of bloody pericardial fluid were removed. The patient was extubated upon arrival to ICU. He remained hemodynamically stable until discharge.

Discussion: The goals for managing tamponade were delicately balanced with the goals for managing his underlying severe cardiomyopathy. While tachycardia improves forward flow in the restricted-filling state of tamponade, it also significantly increases myocardial work and oxygen demand which may exceed the oxygen supply the cardiomyopathic heart is able to provide. To achieve the proper balance, we utilized epinephrine, ketamine, and nitrous oxide for ionotropic support and sympathetic stimulation. In the setting of these medications, the low-dose remifentanil infusion provided analgesia without significant bradycardia. We avoided other medications with negative hemodynamic effects. Etomidate and isoflurane could have been appropriate due to their preservation of cardiac function. The family history of MH, however, necessitated absolute avoidance of volatile agents. Rather, we utilized nitrous oxide, intermittent boluses of ketamine, and low dose remifentanil infusion.

Elevated intrathoracic pressure decreases venous return and increases pulmonary vascular resistance causing decreased RV outflow and systemic hypotension. Thus, spontaneous ventilation is ideal and inhalational inductions are often suggested to minimize hemodynamic compromise. This was contraindicated in our patient, but we preserved spontaneous ventilation with ketamine and midazolam then secured the airway with an endotracheal tube without neuromuscular blockade (as was the intent regardless of MH history).

With the unique anesthetic tailored to his multiple medical conditions, the patient did remarkably well, remaining hemodynamically stable intra- and post-operatively without any evidence of awareness or malignant hyperthermia.

References:
1) Anesthesiol Clin 2010;28(1):87-96