

TITLE: ETOMIDATE vs. THIOPENTAL ANESTHESIA FOR ELECTIVE CARDIOVERSION

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INTRODUCTION: A variety of intravenous anesthetics have been used for cardioversion. The most commonly used agents, Thiopental (T) and Diazepam (D), have significant side effects when used for this procedure, including hemodynamic instability with T more than D, and recall and prolonged sedation with D^{1,2}. Etomidate (E) is an IV anesthetic that provides excellent cardiovascular stability, and has rapid onset and short duration of action. It has been used for induction of anesthesia in patients with cardiac disease as well as for sedation of critically ill patients.^{3,4} E has not been compared in a systematic fashion with any other drug for cardioversion, even though it is currently used for this procedure because of its purported cardiovascular stability. The purpose of this study was to compare E and T for elective cardioversion in a systematic fashion.

METHODS: After IRB approval, sixteen patients scheduled for elective cardioversion were studied in a prospective randomized double blind fashion (E - n=8; T - n=8). Patients were excluded who required emergency cardioversion. All chronic medications were continued and no anesthetic premedication was given. A peripheral IV was placed and monitoring consisted of continuous ECG, continuous radial artery pressure, and verbal communication. Preoxygenation was followed by infusion of two ml aliquots of the appropriate drug every 15 - 30 seconds until the patient no longer responded, at which time the cardioversion was performed. The drugs were prepared in concentrations of 25 mg/cc for T and 2 mg/cc for E. Mean arterial pressure (MAP), heart rate (HR), and respiratory rate (RR) were recorded, and blood drawn for catecholamine determination, before induction, after induction, and after each countershock (CS). The total drug dose (TDD), number of CS (#CS), time to induction (TTI) as reflected by verbal unresponsiveness, recovery time to verbal responsiveness, and complications (myoclonus, injection, pain, recall, purposeful movement, persistent confusion > 10 min) were also recorded. Catecholamine determination was by HPLC-EC. Data are presented as mean \pm error of the mean. Statistical comparison used two-tailed non-paired t test and a 0.05 level of significance.

RESULTS: There was no difference between drugs for any hemodynamic variable (Table 1). RR increased after induction with E but decreased with T (p<0.02), although no patient developed apnea. There was no difference between drugs for clinically relevant factors such as time for induction or recovery time (Table 2). The incidence of complications and side effects for each drug is shown in Table 3. There was no difference between drug groups for changes in epinephrine or norepinephrine.

Table 1: Change(% mean \pm SEM) in heart rate (HR) Mean Arterial Pressure(MAP) and Respiratory Rate (RR)Post-Induction(PI) and Post-Countershock(PCS)

| | % Δ in HR | | % Δ in MAP | | % Δ RR |
|-------------------|------------------|----------------|-------------------|---------------|-----------------|
| | PI | PCS | PI | PCS | PI |
| thiopental n=8 | +7 \pm 4 | -20 \pm 5 | -3 \pm 1 | -9 \pm 5 | -22 \pm 8 |
| etomidate n=8 | +1 \pm 4 | -21 \pm 2 | -4 \pm 4 | -4 \pm 4 | +22 \pm 16 |

Table 2: Total Drug Dose (TDD), Time to Induction (TTI), Time to Verbal Response (TVR) and number of countershocks (# CS) during anesthesia X \pm SEM

| | TDD (mg) | TTI (min) | TVR (min) | # CS |
|------------|----------------|---------------|---------------|---------------|
| thiopental | 250 \pm 30 | 1.8 \pm 0.2 | 6.0 \pm 1.4 | 1.3 \pm 0.3 |
| etomidate | 14.5 \pm 1.1 | 1.3 \pm 0.2 | 4.7 \pm 1.1 | 2.3 \pm 0.6 |

Table 3: Complications/side effects of anesthesia

| | myoclonus | pain | recall | motion | confusion |
|------------|-----------|------|--------|--------|-----------|
| thiopental | 0 | 0 | 1 | 0 | 1 |
| etomidate | 3 | 1 | 1 | 1 | 0 |

DISCUSSION: Both E and T produced rapid anesthesia and recovery with few side effects. Hemodynamic changes were clinically minimal and statistically insignificant. Myoclonus with E was mild and never affected patient management. Any potential hemodynamic advantage of E over T in more compromised patients or in rapid sequence inductions remains to be determined. Either E or T, when titrated to effect, appears satisfactory for elective cardioversion.

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