To Evaluate Dexmedetomidine as an Additive to Propofol for Sedation for Elective Cardioversion in a Cardiac Intensive Care Unit: A Double-blind Randomized Controlled Trial

Abstract

Introduction: Propofol may lead to patient recall and discomfort when used for sedation in elective cardioversion. The aim of the present study was to evaluate dexmedetomidine as an additive to propofol for sedation in elective cardioversion. Materials and Methods: A total of 500 patients undergoing elective cardioversion were randomized into Group 1 (n = 250) and Group 2 (n = 250) on the basis of computer-generated randomization table. Patients in Group 1 were given dexmedetomidine (1 mcg/kg) over 10 min before giving propofol (1 mg/kg), while patients in Group 2 were given only propofol (1 mg/kg). One or two additional doses of 0.5 mg/kg propofol were given if modified Ramsay Sedation Score (mRSS) was <5. Number of patients requiring additional doses were noted. Any hemodynamic or respiratory complication along with the mean time to recovery (mRSS = 1) was recorded. Patient recall, patient discomfort, and further requirement of cardioversion in the next 24 h were also noted. Results: About 10% patients in Group 1 and 64% patients in Group 2 required the first additional dose of propofol. While no patient in Group 1 required second dose, 16% patients in Group 2 required second dose of propofol. The mean time to recovery in Group 1 was 8.36 ± 3.08 min and 8.22 ± 2.38 min in Group 2 (P = 0.569). Sixty-seven patients (26.8%) in Group 1 and 129 patients (51.6%) in Group 2 reported remembering something (P < 0.0001), i.e., recall. Thirty-five patients (14%) in Group 1 and 79 patients (31.6%) in Group 2 reported dreaming during the procedure (P < 0.0001). Visual analog scale score was higher in Group 1 as compared to Group 2. Six patients in Group 1 and 24 patients in Group 2 had a requirement of repeat cardioversion in 24-h follow-up (P = 0.001). Conclusions: Dexmedetomidine is a useful adjunct to propofol for elective cardioversion.

Keywords: Cardioversion, dexmedetomidine, propofol

Introduction

Brief general anesthesia is required for elective cardioversion in hemodynamically stable patients. Various short-acting hypnotics such as methohexitone, diazepam, thiopentone, propofol, and etomidate have been used for this procedure, but side effects such as apnea, drowsiness, or excitation were often observed. Propofol is one of the most commonly used drugs for sedation in patients requiring elective cardioversion.[1,2] However, propofol may lead to patient recall and discomfort because it does not possess any analgesic property. Addition of dexmedetomidine to propofol may lead to a lesser incidence of patient recall. Besides, it may lead to more patient comfort due to some analgesic property. Furthermore, dexmedetomidine may have a propofol-sparing effect. Dexmedetomidine has also been shown to have an antiarrhythmic effect in various studies,[3,4] which may lower the requirement of additional cardioversions.

Hence, the addition of dexmedetomidine to propofol for elective cardioversion could be advantageous to the patient in more ways than one and result in better patient outcome.

Aims and objectives

The aim of the present study was to evaluate the efficacy of dexmedetomidine as an additive to propofol for sedation in cardiac patients undergoing elective cardioversion in a Cardiac Intensive Care Unit (ICU).

The primary objective of the study was to assess whether addition of dexmedetomidine to propofol for sedation...
in elective cardioversion would have any additional benefit to the patient in terms of recall and discomfort, without having any respiratory or hemodynamic compromise.

The secondary objective of this study was to assess whether addition of dexmedetomidine to propofol for sedation in elective cardioversion would lead to a lesser requirement of subsequent cardioversions with a propofol sparing effect.

**Materials and Methods**

After Institutional Ethics Committee approval, this prospective double-blind randomized control study was conducted in a 650-bedded cardiac institute. Written informed consent was taken from 500 hemodynamically stable patients undergoing elective cardioversion for supraventricular arrhythmias in the Cardiac ICU over a period of 1 year. Patients presenting in emergency or in cardiac failure were excluded from the study. Patients were randomized into two groups on the basis of computer-generated randomization table:

1. Group 1 \((n = 250)\): Patients in Group 1 were given dexmedetomidine \((1 \, \text{mcg/kg})\) over 10 min, before giving propofol \((1 \, \text{mg/kg})\)
2. Group 2 \((n = 250)\): Patients in Group 2 were given saline over 10 min and then were given propofol \((1 \, \text{mg/kg})\).

A person unrelated to the study would prepare dexmedetomidine or saline as per computer-generated randomization table in an unlabeled syringe and would give the syringe to the anesthesiologist. Modified Ramsay Sedation Score (mRSS) was noted after 1 min of giving propofol in either group.

mRSS was assessed as follows:

**Grade Patient response**

0 - Paralyzed, unable to evaluate
1 - Awake
2 - Lightly sedated
3 - Moderately sedated, follows simple commands
4 - Deeply sedated, responds to nonpainful stimuli
5 - Deeply sedated, responds only to painful stimuli
6 - Deeply sedated, unresponsive to painful stimuli.

An additional dose of 0.5 mg/kg propofol was given to the patient if mRSS was <5. After giving the additional dose of propofol, mRSS was again assessed after 1 min. A second additional dose of 0.5 mg/kg propofol was administered if mRSS was <5. The number of patients requiring one or two additional doses of propofol was noted in each group.

Hemodynamics (mean arterial pressure [MAP] & heart rate [HR]), SpO\(_2\), and mRSS were monitored every 5 min till 2 h of giving cardioversion.

Any hemodynamic or respiratory compromise along with the mean time to recovery (mRSS = 1) was recorded. Hemodynamic compromise was defined as a fall in MAP >20% of the baseline. Respiratory compromise was defined as SpO\(_2\) <94%, which may or may not require assisted ventilation with bag and mask.

Patient recall and patient discomfort were noted. Patients were asked regarding recall and discomfort after full recovery to mRSS = 1. For assessing discomfort, the patient was asked to complete a 10 cm visual analog scale (VAS) in response to the question: “How much discomfort did you feel with the sedation?” with zero being the highest level of discomfort and 10 being completely comfortable.

For assessing recall, the patient was asked a validated awareness questionnaire\(^5\) which included the following questions:

1. What was the last thing you remembered before the procedure?
2. What was the next thing you remember?
3. Can you remember anything in between these two periods?
4. Can you remember dreaming during your procedure?
5. If yes, did you notice sounds or conversations, paralysis, touch or movement, visual perceptions or pain.

Any further requirement of elective cardioversion for supraventricular arrhythmias was also noted in the next 24 h.

Results were analyzed using unpaired Students’ \(t\)-test and Chi-square test. \(P < 0.05\) was considered statistically significant.

**Results**

Demographics of the patients in the two groups were comparable [Table 1].

Twenty-five (10%) patients in Group 1 and 160 (64%) patients in Group 2 required the first additional dose of propofol. While no patient in Group 1 required second dose, 40 (16%) patients in Group 2 required second dose of propofol.

MAP was comparable in the two groups [Figure 1].

A total of 153 patients in Group 1 and 161 patients in Group 2 had a fast ventricular rate (HR >100 beats/min) \((P = 0.52)\). Rest of the patients had a controlled ventricular rate in both the groups. Mean HR was lower in Group 1 as compared to Group 2, but it was not statistically significant [Figures 2 and 3].

| Table 1: Demographics of the two study groups |
|---------------------------------------------|
| Sex  | Age (years) | Weight (kg) |
| Male | Female    |          |
|------|------------|-----------|
| Group 1 | 124        | 126       | 56.76±10.33 | 72.46±8.86 |
| Group 2 | 118        | 132       | 55.06±11.29 | 73.26±9.64 |
| \(P\) | 0.655      | 0.079     | 0.335      |
Twenty-three patients in Group 1 and 26 patients in Group 2 had a fall in SpO$_2$ below 94% ($P = 0.764$). Five patients in Group 1 and 3 patients in Group 2 required assisted ventilation with bag and mask ($P = 0.724$). Rest of the patients recovered with oxygen supplementation with a simple oxygen mask.

Similar findings were seen in the study conducted by Gupta et al.,$^{[10]}$ in which some patients who were given propofol required assisted ventilation due to apnea and fall in SpO$_2$.

The mean time to recovery in Group 1 was comparable to Group 2. Patient discomfort was lesser in Group 1 as compared to Group 2, which may be attributed to some analgesic property of dexmedetomidine. Furthermore, there was a significant difference between the two groups with regard to patient recall.

Patient awareness and recall are a frightening experience for the patient, but these are often overlooked. Patients with anesthetic awareness report various intraoperative experiences$^{[11,12]}$ [Table 2]. Some patients describe
this situation as the worst experience they ever had in a hospital.\textsuperscript{[12]} About 2\% of the legal claims against anesthesiologists involve cases of awareness.\textsuperscript{[13]} Dexmedetomidine significantly decreased awareness and recall as compared to propofol alone.

Six patients in Group 1 and 24 patients in Group 2 had a requirement of repeat cardioversion in 24-h follow-up ($P = 0.001$). Thus, dexmedetomidine may have provided protection against arrhythmias leading to a lesser requirement of repeat cardioversion in 24-h follow-up. There have been various studies on the role of dexmedetomidine in preventing and treating arrhythmias.\textsuperscript{[3,4]} One of the possible mechanisms by which it causes its antiarrhythmic action is by causing sympatholysis.

Dexmedetomidine also demonstrated a propofol sparing effect, which was evident from lesser number of patients requiring additional first or second dose of propofol to achieve a mRSS = 5.

Hence, we advocate adding dexmedetomidine to propofol for procedural sedation in elective cardioversion.

A limitation of the study was that there was no objective measure of the depth of sedation recorded. One possible solution would be to use bispectral index monitoring. However, because of the cost issues involved in the study with a large sample size, we had to go with the next best parameter, i.e., mRSS.

\section*{Conclusions}

Dexmedetomidine when added to propofol leads to less patient discomfort, better mRSS, lesser requirement of propofol and causes insignificant recall. Hence, it is advised to add dexmedetomidine to propofol for sedating patients undergoing elective cardioversion in a Cardiac ICU.

\section*{Financial support and sponsorship}

Nil.

\section*{Conflicts of interest}

There are no conflicts of interest.

\section*{References}

1. Coll-Vinent B, Sala X, Fernández C, Bragulat E, Espinosa G, Miró O, et al. Sedation for cardioversion in the emergency department: Analysis of effectiveness in four protocols. Ann Emerg Med 2003;42:767-72.

2. Symington L, Thakore S. A review of the use of propofol for procedural sedation in the emergency department. Emerg Med J 2006;23:89-93.

3. El-Shmaa NS, El Anrousy D, El Feky W. The efficacy of pre-emptive dexmedetomidine versus amiodarone in preventing postoperative junctional ectopic tachycardia in pediatric cardiac surgery. Ann Card Anaesth 2016;19:614-20.

4. Chrysostomou C, Beerman L, Shiderly D, Berry D, Morell VO, Munoz R. Dexmedetomidine: A novel drug for the treatment of atrial and junctional tachyarrhythmias during the perioperative period for congenital cardiac surgery: A preliminary study. Anesth Analg 2008;107:1514-22.

5. Ghoneim M. Awareness During Anaesthesia. Oxford: Butterworth Heinemann; 2001.

6. Lebowitz WB. Electrical conversion of arrhythmias under diazepam sedation. Conn Med 1969;33:173-4.

7. Kahler RL, Burrow GN, Felig P. Diazepam-induced amnesia for cardioversion. JAMA 1967;200:997-8.

8. Lechleitner P, Genser N, Mittersichthaler G, Dienstl F. Propofol for direct current cardioversion in cardiac risk patients. Eur Heart J 1991;12:813-7.

9. Sterlin EJ, Hägental M. Anaesthesia for cardioversion – Clinical experiences with propofol and thiopentone. Acta Anaesthesiol Scand 1991;35:606-8.

10. Gupta A, Lennmarken C, Vegfors M, Tydén H. Anaesthesia for cardioversion. A comparison between propofol, thiopentone and midazolam. Anaesthesia 1990;45:872-5.

11. Bailey AR, Jones JG. Patients’ memories of events during general anaesthesia. Anaesthesia 1997;52:460-76.

12. Myles PS, Leslie K, McNeil J, Forbes A, Chan MT. Bispectral index monitoring to prevent awareness during anaesthesia: The B‑aware randomised controlled trial. Lancet 2004;363:1757-63.

13. Domino KB, Ponner KL, Caplan RA, Cheney FW. Awareness during anesthesia: A closed claims analysis. Anesthesiology 1999;90:1053-61.