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Sedation in Surgical ICU – Dexmedetomidine Versus Propofol Infusion

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Abstract

Context: The sedation strategy in critical care unit is devised so as to minimize paralysis and to facilitate daily awakening to assess the neurologic, respiratory and cognitive functions. Sedation alleviates anxiety, increases tolerance for endotracheal tube and decreases risk of accidental extubation by patient. Inadequate sedation can greatly affect the morbidity and mortality of the patients. Commonly used agents for sedation are benzodiazepines like midazolam; opioids like morphine, fentanyl, remifentanyl; propofol; alpha agonists like dexmedetomidine.

Objective: To compare the sedative efficacy of propofol and dexmedetomidine for short-term sedation in ICU in mechanically ventilated patients.

Propofol is a gamma aminobutyric acid agonist, sedative and hypnotic, most commonly used for induction and maintenance of anaesthesia. Propofol having low context sensitive half-life gives the advantage of early awakening and extubation.

Dexmedetomidine is a centrally acting highly selective alpha 2 adrenergic agonist that provides sedation as well as anxiolysis. It is approved by FDA for ICU sedation for a maximum of 24 hours. It produces only mild cognitive impairment hence communication between patient and physician is maintained.

Methods: Patients requiring mechanical ventilation for a minimum of 10 hours and a maximum of 24 hours were selected and randomized to receive either propofol or dexmedetomidine. Sample size for each group was decided in assistance with the statistician.

Conclusion: in our study, patients receiving dexmedetomidine were weaned off the mechanical ventilator quicker with a smoother extubation as compared to propofol. These patients were also able to communicate better with the physician post extubation.

Keywords: Sedation, ICU, Dexmedetomidine, Propofol

Introduction

Inadequate sedation in the intensive care unit adversely affects the morbidity and mortality of the

patients.Intubated mechanically ventilated patients in the surgical ICU require sedation to tolerate the tracheal tube and the ventilator, to suppress cough and prevent respiratory fighting during intensive care procedures[5]. Multiple pharmacologic options are being researched to find an ideal sedative. The ideal sedative agent should allow for rapid modification of the sedation level by modifying the dosage (titratable) and should not have depressor effect on the cardiovascular or respiratory systems[5]. An ideal sedative should not only provide sedation and analgesia but should also prevent anxiety and unpleasant memories for the patient.

The aim of this study was to compare dexmedetomidine based sedation with propofol.

Material and methods

This is a randomized control study conducted in post operative surgical ICU of MGM Medical College after taking approval from institute's ethical committee. Duration of study was 2 months (1st March 2022 to 30th April 2022).

Inclusion criteria

1. Patients giving consent to participate in the study
2. Patients on mechanical ventilation who were given sedation
3. Duration of sedation < 24 hours
4. Age > 18 years

Exclusion criteria

1. Patient refusal to participate in the study
2. Age < 18 years and > 60 years
3. Duration of sedation > 24 hours
4. Patients on inotropic support
5. Patients with severe coronary artery disease
6. Patients with cardiac dysrhythmias
7. Patients allergic to egg

All the patients that fit in the inclusion criteria were divided into two groups based on random allocation by chit system.

Group D – Patients who were put on infusion Inj. Dexmedetomidine started at a loading dose of 1mcg/kg given over 15 mins followed by maintenance dose of 0.7mcg/kg/hr.

Group P – Patients who were put on infusion Inj. Propofol started at loading dose of 2mg/kg over 10 mins followed by maintenance dose of 150mcg/kg/min.

The heart rate, systolic blood pressure, diastolic blood pressure and respiratory rate of patients in each group was monitored at 5 mins, 15 mins, 30 mins, 1 hour, 2 hours, 4 hours, 6 hours, 8 hours, 10 hoursm 12 hours, 14 hours and 16 hours. The time from stopping of infusion to extubation was also noted.

Inj Atropine 0.6mg was kept at bed side of patients who were on dexmedetomidine infusion to compensate for any bradycardia (heart rate less than 50 beats per minute). Inj. Fentanyl 1mcg/kg bolus dose was used for rescue analgesia. Any adverse events were noted and compared.

Result

Table 1: shows the distribution of patients in either group. Equal distribution of patients in each group.

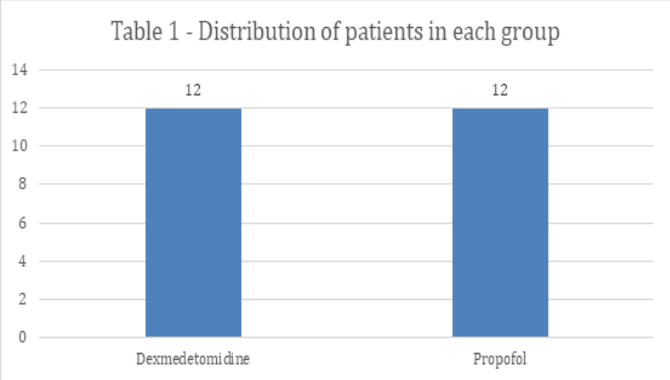


Table 2: shows dexmedetomidine infusion is better at maintaining the heartrate. Group P shows episodes of

tachycardia probably associated with inadequate anxiolysis or analgesic.

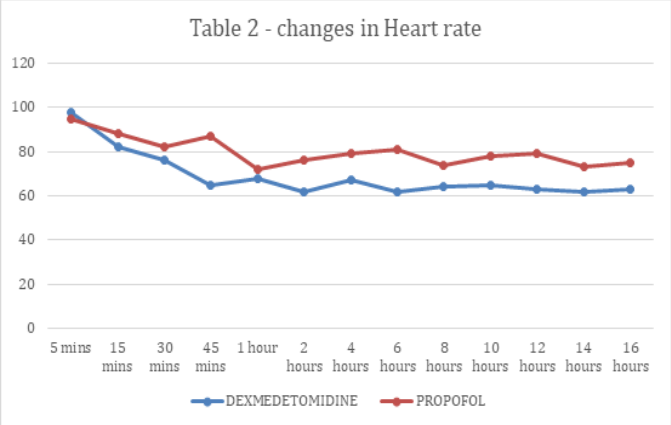
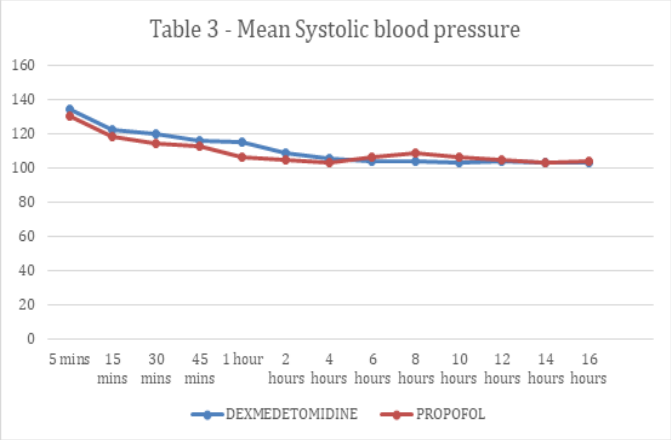


Table 3 and 4: show that both groups respond equally to changes in systolic as well as diastolic blood pressure stating that either drug is equally effective is keeing the blood pressure closer to baseline.



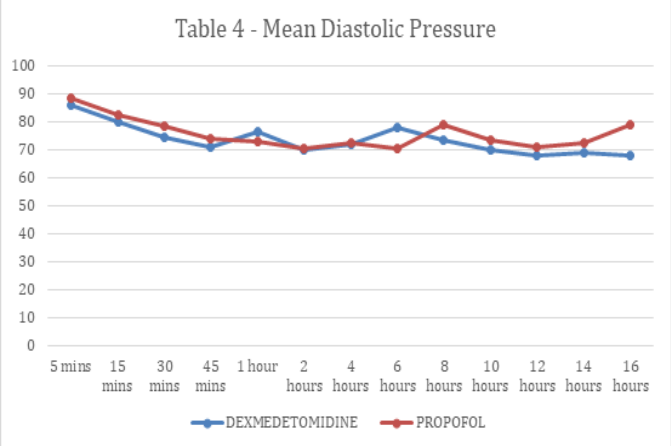
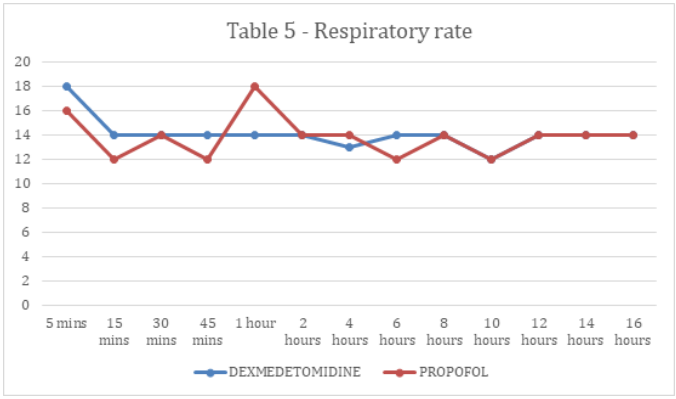


Table 5: shows changes in respiratory rate. Group D showed a more stable breathing pattern on mechanical ventilator as compared to Group P.



Discussion

A great deal of patients who undergo brain tumor excision, spine surgeries, wide local excision of carcinoma and many other long duration, complicated surgeries may need to be shifted to surgical ICU on mechanical ventilator for further observation and slow weaning off from ventilator. These patients need to be sedated to cope with the anxiety and discomfort of endotracheal tube and to maintain hemodynamic stability. A variety of drugs have been researched for this purpose. The sedative strategy for critically ill patients has emphasized light sedation with daily awakening and assessment for neurologic, cognitive, and respiratory functions.[2] The titration of the sedative dose to a defined goal is recommended, with systematic tapering of the dose or daily interruption with re-titration to minimize prolonged sedative effects.[2] In our study, we used Inj. Dexmedetomidine or Inj. Propofol based on study group and compared their efficacy and effects.

Dexmedetomidine is alpha 2 adrenergic agonist that acts on pontine locus ceruleus, which is an important nucleus mediating sympathetic nervous system function, vigilance, memory, analgesia and arousal. Unlike other sedatives, it has sedative as well as analgesic properties.

Propofol is 2,6-diisopropylphenol which is gamma – Aminobutyric acid agonist. It is one of the oldest drugs that is used for rapid induction and rapid emergence.

This study shows that dexmedetomidine is better for sedation in ICU. The patients in Group D were tolerating the endotracheal tube and had a heart rate and blood pressure closer to baseline. However, group P had intermittent spikes in heart rate and required additional bolus doses of analgesics like fentanyl to keep the patient adequately sedated. 66.66% of patients in Group P required additional doses of Inj. Fentanyl. Even though patients in both groups were easily arousable, the patients in Group D showed better airway reflexes post extubation while 25% patients in Group P required assistance of nasopharyngeal airway post extubation to maintain airway. Since, dexmedetomidine causes minimal cognitive dysfunction, the patients in Group D had lower extubation hemodynamic response leading to a smoother extubation as compared to Group P. The traditional sedatives have some limitations as safe drugs for this strategy due to their unfavorable pharmacokinetic or detrimental adverse effects that include lorazepam-associated propylene glycol intoxication and propofol infusion syndrome.[2] According to our study, 8% patients in Group D required Inj Atropine to control bradycardia caused by Inj. Dexmedetomidine. Group D required close monitoring to avoid excessive bradycardia or hypotension. Overall, the patients were more comfortable and sedated with Inj. Dexmedetomidine.

Conclusion

This study shows that dexmedetomidine is a better drug to maintain sedation in ICU. It can be safely used in patients with respiratory problems, as it does not cause any respiratory depression. It not only maintains the sedation but is also an excellent analgesic leading us towards an opioid free analgesia practice.

Limitations of the study

This is a pilot study; a larger sample size should be taken to extrapolate these findings to entire population. Inj. Dexmedetomidine is FDA approved for continuous infusion up to 24 hours only.

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