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Comparison between Dexmedetomidine and Propofol for Sedation: A Cross Sectional Study

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ABSTRACT: Dexmedetomidine is an analgesic, anxiolytic and sedative medication. It is famous for its ability to provide cooperative or semi-rousable sedation without risk of respiratory depression. It acts as an agonist of α_2-adrenergic receptors in definite parts of the brain as sympatholytic drug similar to Clonidine. Dexmedetomidine is regularly used in the intensive care unit for light to moderate sedation not recommended for long-term deep sedation. Adding to its role as a hypnotic, it also has analgesic properties and is not related with significant respiratory depression.[1]50 patients who are undergoing surgery for various reasons were included in the study. Dexmedetomidine could be a better substitute to propofol for patients undergoing surgery to maintain pulse rate, blood pressure and saturation in mechanically ventilated patients; however, use of adjunct may be necessary to decrease the need for rescue drug.

KEYWORDS: Dexmedetomidine, Propofol.

I. INTRODUCTION:

Dexmedetomidine is an analgesic, anxiolytic and sedative medication. It is famous for its ability to provide cooperative or semi-rousable sedation without risk of respiratory depression. It acts as an agonist of α_2-adrenergic receptors in definite parts of the brain as sympatholytic drug similar to Clonidine. Dexmedetomidine is regularly used in the intensive care unit for light to moderate sedation not recommended for long-term deep sedation. Adding to its role as a hypnotic, it also has analgesic properties and is not related with significant respiratory depression.[1]

Many studies suggest the use of dexmedetomidine for sedation may lessen the time to extubation and ICU stay in mechanically ventilated adults. Another feature of dexmedetomidine is people on this drug can be rousable and cooperative during some procedures. Moreover for an economic perspective, dexmedetomidine is associated with lower ICU costs, mainly due to a shorter time to extubation.[2]

Propofol was first discovered in 1977 and it is one among the World Health Organization's Essential Medicines list. It is available as a generic medication and is referred to as milk of amnesia, because of the milk-like appearance of the intravenous preparation and for the reason that of its tendency to suppress memory recall.[3]

Propofol mainly has negative effects on consciousness and memory. It is used as sedative for mechanically ventilated adults, in starting and maintenance of general anesthesia, in procedural sedation and also for status epilepticus if other medications have not worked. It is given as intravenous injection and the maximum effect occurs within two minutes and lasts for about five to ten minutes. Frequently observed adverse effects include an irregular heart rate, hypotension, a burning sensation at the site of injection and apnea. Additional serious side effects may include seizures, infections due to improper use, propofol infusion syndrome with long-term use. Some of the drawback of this drug is that its use during pregnancy is not studied clearly and is not recommended for use during a cesarean section.[4]

OBJECTIVE: To compare between Dexmedetomidine and Propofol for Sedation.

II. MATERIALS AND METHODS:

50 patients who are undergoing surgery for various reasons at East Point College of medical sciences and research centre, were included in the study.

All the above said patients were in mechanical ventilation. In Group A constitutes of 25 patients, sedation was carried out by intravenous infusion of dexmedetomidine at a dose of 0.2 to 0.7 mcg/kg/hour. In Group B constitutes of 25 patients, sedation was performed by intravenous propofol infusion at a dose of 4 to 12 mg/kg/hour.

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Ethical approval: For collection and analysis of data in our study approval was obtained by institutional ethical committee.

III. RESULTS:

Table 1: Demographic characteristics of the patients.

	Dexmedetomidine group (n=25)	**Propofol group (n=25)**
Age in years	Average 60 years	Average 61 years
Sex ratio(male:female)	17:8	19:6
BMI	Average 23	Average 24
Co-morbidities		
• **Hypertension**	8	10
• **Diabetes**	6	3
• **COPD**	5	9

There were no significant differences in age, sex, body mass index and co morbidities between the two groups.

Table 2: Intraoperative and postoperative characteristics.

	Dexmedetomidine group (n=25)	**Propofol group (n=25)**
Total surgery time (minutes)	35	39
Time to targeted sedation (minutes)	20	13
Recovery time (minutes)	9	6
Side effects		
• **Nausea**	7	3
• **Vomiting**	5	4
• **Headache**	6	3

However, there was a difference in the time required to achieve the same level of sedation. Targeted sedation was achieved within 13 min with propofol, but took nearly 20 min with dexmedetomidine. During recovery, patients who had received dexmedetomidine during surgery had a slightly longer recovery time compared with patients who received propofol.

Table 3: Patient parameters after Thirty minutes after the start of sedation.

	Dexmedetomidine group (n=25)	**Propofol group (n=25)**
HR	81 ± 10 beats/minute	86 ± 11 beats/minute
BP	122 ± 11/66 ± 9 mmHg	132 ± 12/67 ± 8 mmHg
SPO2	97 ± 3%	97 ± 2%

In patients of group A, after 30 minutes, pulse was 81 ± 10 beats/minute, BP was 122 ± 11/66 ± 9 mmHg, saturation was 97 ± 3%. In patients of the group B, after 30 minutes, pulse was 86 ± 11 beats/minute, BP was 132 ± 12/67 ± 8 mmHg, saturation was 97 ± 2%.

Table 4: Patient parameters after one hour after the start of sedation.

	Dexmedetomidine group (n=25)	**Propofol group (n=25)**
HR	82 ± 10 beats/minute	83 ± 11 beats/minute
BP	120 ± 11/66 ± 9 mmHg	96 ± 12/57 ± 8 mmHg
SPO2	98 ± 2%.	97 ± 1%.

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In patients of group A, after one hour, pulse was 82 ± 10 beats/minute, BP was 120 ± 11/66 ± 9 mmHg, saturation was 98 ± 3%. In patients of the group B, after one hour, pulse was 83 ± 11 beats/minute, BP was 96 ± 12/57 ± 8 mmHg, saturation was 97 ± 1%.

Table 5: Patient parameters after 3 hours after the start of sedation.

	Dexmedetomidine group (n=25)	**Propofol group (n=25)**
HR	87 ± 10 beats/minute	74 ± 11 beats/minute
BP	106 ± 11/66 ± 9 mmHg	91 ± 12/67 ± 8 mmHg
SPO2	98 ± 2%.	96 ± 3%.

In patients of group A, after 180 minutes, pulse was 87 ± 10 beats/minute, BP was 106 ± 11/66 ± 9 mmHg, saturation was 98 ± 2%. In patients of the group B, after 180 minutes, pulse was 74 ± 11 beats/minute, BP was 91 ± 12/67 ± 8 mmHg, saturation was 96 ± 3%.

IV. DISCUSSION:

In the present study there were no significant differences in age, sex, body mass index and co morbidities between the two groups. However, there was a difference in the time required to achieve the same level of sedation. Targeted sedation was achieved within 13 min with propofol, but took nearly 20 min with dexmedetomidine. During recovery, patients who had received dexmedetomidine during surgery had a slightly longer recovery time compared with patients who received propofol. In patients of group A, after 30 minutes, pulse was 81 ± 10 beats/minute, BP was 122 ± 11/66 ± 9 mmHg, saturation was 97 ± 3%. In patients of the group B, after 30 minutes, pulse was 86 ± 11 beats/minute, BP was 132 ± 12/67 ± 8 mmHg, saturation was 97 ± 2%. In patients of group A, after one hour, pulse was 82 ± 10 beats/minute, BP was 120 ± 11/66 ± 9 mmHg, saturation was 98 ± 3%. In patients of the group B, after one hour, pulse was 83 ± 11 beats/minute, BP was 96 ± 12/57 ± 8 mmHg, saturation was 97 ± 1%. In patients of group A, after 180 minutes, pulse was 87 ± 10 beats/minute, BP was 106 ± 11/66 ± 9 mmHg, saturation was 98 ± 2%. In patients of the group B, after 180 minutes, pulse was 74 ± 11 beats/minute, BP was 91 ± 12/67 ± 8 mmHg, saturation was 96 ± 3%.

A study by Hong-mei Wang et al, found that the use of dexmedetomidine for conscious sedation in patients who underwent ambulatory inguinal hernia repair was associated with a reduced requirement for opioids, a longer time for onset of sedation, a slightly longer recovery time, and fewer adverse events compared with propofol at similar sedation levels. In their study, all of the patients achieved targeted sedation levels. Although the level of sedation was sufficient for the complete procedure, more fentanyl was required in the Pro group than in the Dex group to decrease the surgical pain. This is because the analgesic effect of dexmedetomidine resulted in a reduction in requirement for fentanyl in the Dex group and also had a lower postoperative pain score than those in the Pro group. Further in their study, infusion of dexmedetomidine was terminated at the end of the surgical procedure. Because the half-life of dexmedetomidine is 3 h, the analgesic effects of dexmedetomidine were persisted in the recovery period. Serious hemodynamic events such as bradycardia and hypotension were the not reported. This could be due to the use of low dose of dexmedetomidine used in their study.[5]

Another study by R.M.Venn et al, showed that dexmedetomidine is an effective and safe agent for use as post-operative sedation in the ICU. They showed that the opioid requirement was reduced by over 50% in patients who received dexmedetomidine. In their study patients sedated with dexmedetomidine presumably reflects only mild cognitive impairment this may explains the ease and speed of extubation after dexmedetomidine infusions. In this study also numerous adverse cardiovascular events were not seen. This was achieved by reducing the dexmedetomidine dose during the loading infusion. However, the significantly lower heart rates seen with dexmedetomidine in comparison with patients receiving propofol may lower the risk of ischaemic events during the stressful ICU episode, in particular over the extubation period.[6]

A study by Srivastava et al, showed significant decrease in heart rate in group on Dexmedetomidine with more stable blood pressure values all over the ERCP procedure than the group on Propofol (65.27 ± 4. 3 vs.77.27 ± 9.3). There were episodes of transient desaturation in few patients in group on Propofol while no patient showed any signs of respiratory depression or desaturation in group on Dexmedetomidine. The time to achieve Ramsay sedation score (RSS) 3-4 is significantly more in on Dexmedetomidine (11.4 ±

1.37 vs. 7.93 ± 1.32) with increased tendency to use rescue drug but shows better and early recovery. Dexmedetomidine is a better substitute to propofol for patients undergoing ERCP; however, use of adjunct may be necessary to decrease the need for rescue drug.[7]

V. CONCLUSION:

Dexmedetomidine could be a better substitute to propofol for patients undergoing surgery to maintain pulse rate, blood pressure and saturation in mechanically ventilated patients; however, use of adjunct may be necessary to decrease the need for rescue drug.

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