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Original Research Paper

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PRACTICE OF USING DEXMEDETOMIDINE INTRAOPERATIVELY- A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Dexmedetomidine is an alpha-2 agonist, more selective than clonidine. It was introduced as a sedative agent in ICU setting. Over years its use has been established in several clinical settings in view of diverse actions that include sedation, analgesia, anxiolysis, perioperative sympatholysis, cardiovascular stabilizing effects, reduced anaesthesia requirements, preservation of respiratory function. **Materials And Methods:** Study was carried out over three months in operation theatres under the department of Anaesthesiology. Pregnant females and paediatric patients were excluded. Primary objective was to determine the prevalence of using dexmedetomidine intraoperatively. Patients receiving dexmedetomidine were noted and studied for the route of administration, duration of infusion, total dose, any hemodynamic complications and its treatment, any reason for stopping the infusion. **Results:** Over the study period 1940 elective cases happened, of which dexmedetomidine was used in 180 cases. Thus the prevalence of using dexmedetomidine intraoperatively was 9.28%. It was used through IV route in all these patients for maintenance of anaesthesia, sedation or hemodynamic stability. **Conclusion:** This study concluded that dexmedetomidine can be considered in various surgeries for sedation, maintenance of anaesthesia and hemodynamic stability with hemodynamic monitoring. No serious adverse effects other than hypotension and bradycardia were observed in these patients. These effects were reversible with simple intervention.

KEYWORDS : Dexmedetomidine, Alpha2-agonists, Prevalence

INTRODUCTION:

Dexmedetomidine has emerged as an important adjunct in general anaesthesia, reducing the requirement of intravenous agents, inhalational agents, and opioids while providing stable intraoperative hemodynamics, smooth recovery, and shorter postoperative hospital stay. Initially approved in 1999 as a short-term ICU sedative, it is now widely used for sedation in day-care procedures and in regional anaesthesia. -2 adrenoceptor agonists were first introduced with clonidine in the 1960s, initially as a nasal decongestant and later as an antihypertensive. Further insights from veterinary agents led to the development of dexmedetomidine as a potent sedative-analgesic.[1,2]

α-2 adrenoreceptor agonists are valuable in anaesthetic practice due to their ability to reduce sympathetic tone and attenuate neuroendocrine and hemodynamic responses to surgery.[3] Dexmedetomidine when used as intravenous anaesthesia agent, also overcomes disadvantages of inhalational agents (eg. High cost, greenhouse effect, undesirable systemic effects, etc.). It provides effective perioperative sedation and analgesia with preserved psychomotor function and stable hemodynamics. Its applications include premedication, ICU and procedural sedation, regional and local anaesthesia adjuvant use, attenuation of intubation and extubation responses, cardiac and neurosurgery, MRI procedures, monitored anaesthesia care, pain and palliative care, and day-care surgeries.[4,5] Dexmedetomidine is associated with predictable cardiovascular adverse effects, most commonly bradycardia and hypotension, and less frequently transient hypertension. The hypertensive response is attributed to stimulation of peripheral α-2 adrenoceptors in vascular smooth muscle and is usually self-limiting, often avoided by slow administration or omission of a loading dose. Bradycardia and hypotension result from presynaptic α-2 receptor activation leading to reduced norepinephrine release, along with central sympatholysis, and these effects may occur irrespective of the route of administration.[1,2]

Despite potential cardiovascular depression, it improves hemodynamic stability, suppresses stress responses, prevents tachyarrhythmias, reduces shivering, and supports ERAS protocols with reduced opioid consumption.[5]

Dexmedetomidine is finding its way into every segment of anaesthesia practice and it may stay firmly in anaesthetist's armamentarium.

This study is conducted to learn the prevalence of use of dexmedetomidine at a tertiary care center and to promote the advantages of this drug in anaesthesia practice.

METHODS:

We conducted a prospective observational study to know the prevalence of dexmedetomidine use during various surgeries at our center. After the approval of departmental review board and institutional ethics committee (IEC), study was carried out over three months. Waiver of consent was obtained. During this period 1940 elective cases happened in operation theatres under department of Anaesthesiology. These cases excluded pregnant females and paediatric patients. All patients in OTs were attached standard ASA monitors. Patients in which dexmedetomidine was used were supplemented with oxygen. Dexmedetomidine infusion was prepared using 200 mcg dexmedetomidine (2ml) diluted with normal saline and total solution of 50 ml (4 mcg/ml) was prepared. Out of 1940 patients, 180 patients received dexmedetomidine intraoperatively during anaesthesia. Hypotension was defined as MAP less than 65 and bradycardia was defined as HR less than 60. Statistical analysis data from case record forms was entered in the Microsoft Excel sheet and analysed using SPSS version 21 software. Descriptive statistics were assessed. Quantitative variables were represented as frequencies and percentages. Quantitative data between two groups was compared using a unpaired t test for data with normal distribution and Mann Whitney test for data which was not normally distributed. Qualitative variables between two groups were compared

using Chi-square test or Fisher's exact test. Level of significance in this study was considered at p value of less than or equal to 0.05

RESULTS:

During our study, we observed dexmedetomidine was used in 180 patients out of 1940. Thus prevalence of using dexmeditomidine in our tertiary care hospital was 9.28%. Among 180 patients, 50.56% were females and 49.44 % were males. The mean age of patients was 34.46 ± 13.26 years (14-83). Most of the patients (85.56%) belonged to ASA physical state class I, while 14.44 % were ASA Class II. In all the patients dexmedetomidine was used by intravenous route only. Among 180 patients who received dexmedetomidine intraoperatively, it was most commonly used for sedation (59.44 %). It was used during maintenance of anaesthesia in 34.45% patients, while in 6.11% patients, it was used to control hemodynamics. While giving IV infusion, 47.22% patients were administered only maintenance dose while 52.78 % patients received loading dose as well. The mean duration of infusion of dexmedetomidine was 2.72 ± 1.01 hours (0.5-8). We observed bradycardia and hypotension in 27.22 % patients, bradycardia being most common. In most of the patients, during episodes of bradycardia and hypotension, rate of infusion of dexmedetomidine was reduced (46.94% patients). In four patients infusion of dexmedetomidine was stopped because of severe hypotension and bradycardia. The incidence of hemodynamic instability (hypotension, bradycardia) in patients who received maintenance infusion along with loading dose and those who received only maintenance infusion was comparable with p value of 0.7024. The incidence of complications in ASA I class was significantly lower than ASA II class with p value of 0.0048. The incidence of hemodynamic instability was higher in patients who received higher mean total dose with p value of 0.0055. The duration of infusion of dexmedetomidine in patients with and without complications was comparable with p value of 0.1554. The incidence of complications in patients with more than 60 years of age was higher as compared to those with age less than 60 years, however, this incidence was not statistically significant.

Table1 : Intraoperative Use Of Dexmedetomidine

Purpose of starting Dexmedetomidine	Frequency	Percent
Hemodynamic stability	11	6.11
Maintenance of anaesthesia	62	34.45
sedation	107	59.44
TOTAL	180	100.00

Table 2: Incidence Of Complications

Complications	Frequency	Percent
No	131	72.78
Yes (Hypotension, bradycardia)	49	27.22
TOTAL	180	100.00

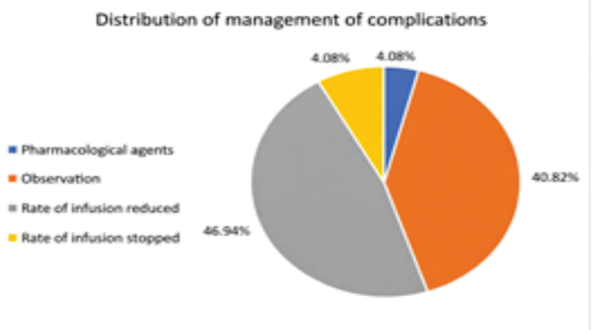

Figure 1: Management of complications

DISCUSSION

Dexmedetomidine is widely utilized in modern anaesthesia practice for procedural sedation in a variety of surgical and diagnostic settings and is particularly advantageous due to its ability to provide cooperative sedation with minimal respiratory depression.[1,6] It is also commonly administered as an adjunct infusion during general anaesthesia, where it has been shown to reduce postoperative pain, opioid requirements, and the incidence of postoperative nausea and vomiting.[7] Similar opioid-sparing benefits have been observed when dexmedetomidine is used during procedures performed under spinal anaesthesia.[8] There has been growing interest for its role in reducing emergence agitation, postoperative delirium, and cognitive dysfunction. Dexmedetomidine has also been employed as an adjuvant in peripheral nerve blocks, with studies demonstrating prolongation of analgesia by approximately three hours.[9]

In the our study, dexmedetomidine was used in 9.28% of patients undergoing anaesthesia, reflecting its selective and indication-based use in a tertiary care setting. The demographic profile showed near-equal gender distribution and a relatively young patient population, with the majority belonging to ASA physical status class I. This may reflect clinicians' preference to use dexmedetomidine in patients with fewer comorbidities, given its known cardiovascular effects. Intravenous administration was the sole route used, consistent with its established pharmacokinetic profile for controlled perioperative sedation and anaesthesia.

Dexmedetomidine was most commonly employed for intraoperative sedation, followed by maintenance of anaesthesia and hemodynamic control, highlighting its versatility as both a sedative and anaesthetic adjunct. In a prospective observational study by Vega Sepulveda RA, Dexmedetomidine was used for intravenous sedation for middle ear surgery and concluded that dexmedetomidine can be used for adequate sedation without serious side effects.[10] In a Comparative study by Rafi Dogan et al, dexmedetomidine was used to provide sedation for septoplasty under local anaesthesia and it gained more patient satisfaction as compared with general anaesthesia.[11] Richa et al used dexmedetomidine infusion for obtaining controlled hypotension during tympanoplasty under general anaesthesia and received satisfactory results.[12]

In a study by Amir Taghinia, intraoperative parameters were studied with and without dexmedetomidine sedation. They observed hypotension, hypertension and desaturation during dexmedetomidine infusion. Hypotension was most common and vasopressors were used to treat hypotension ($P < 0.01$).[13]

Bradycardia and hypotension were the most frequently observed adverse effects during our study (27.22%), consistent with the sympatholytic action of dexmedetomidine. Importantly, the incidence of complications was significantly higher in ASA II patients and in those receiving higher mean total doses, emphasizing the need for cautious dosing and vigilant monitoring in patients with limited physiological reserve.

Several studies have evaluated the hemodynamic effects of dexmedetomidine administered with a loading dose followed by maintenance infusion compared with maintenance infusion alone. Abdelmalak et al. demonstrated a higher incidence of bradycardia and hypotension when a loading dose was used, suggesting that omission of the bolus improves cardiovascular stability without compromising sedation quality.[6] Similar observations were reported by Venn et al., where slow infusion without a loading dose resulted in fewer adverse hemodynamic events in ICU patients.[14]

These findings are consistent with our study, where more than half of the patients received a loading dose in addition to maintenance infusion; however, the incidence of hemodynamic instability was comparable between patients who received a loading dose and those who did not. This

suggests that factors other than loading dose alone, such as total dose and patient characteristics, play a more significant role in determining cardiovascular effects.

Management of dexmedetomidine-induced hemodynamic instability primarily involves early recognition and dose adjustment. Reduction or temporary cessation of the infusion is usually sufficient to restore hemodynamic stability in most cases.[15,16]

During our study most episodes of severe bradycardia and hypotension were managed successfully by reducing the infusion rate, indicating that these effects are dose-dependent and often reversible. Overall, the findings support the safe use of dexmedetomidine when judiciously administered, with individualized dosing to minimize hemodynamic instability.

Dexmedetomidine offers several advantages over conventional intravenous and inhalational anaesthetic agents owing to its unique pharmacological profile.[1,2] Additionally, dexmedetomidine avoids the environmental pollution and occupational exposure associated with inhalational agents and can be administered as a controlled infusion without the need for specialized delivery systems. These advantages make dexmedetomidine a valuable alternative or adjunct to traditional intravenous and inhalational anaesthetic agents.

The present study aimed to investigate the utilization patterns of dexmedetomidine in our clinical setting, with a view to highlighting its benefits and potential applications in anaesthesia practice, thereby contributing to the existing body of evidence on its efficacy and safety.

CONCLUSION:

In our study the prevalence of using dexmedetomidine was found to be 9.28%. Dexmedetomidine was used in 180 cases out of 1940 cases over the period of three months. In these 180 cases which used dexmedetomidine, no serious adverse effects other than hypotension and bradycardia were observed. These effects were reversible with simple interventions. Thus dexmedetomidine can be considered in various surgeries for sedation, maintenance of anaesthesia and hemodynamic control with hemodynamic monitoring.

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Conflicting Interest: None

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