Original Article

ISSN (O): 2456-7388; ISSN (P): 2617-5479

Evaluation of the Efficacy and Safety of Dexmedetomidine versus Propofol for Sedation in Children Undergoing MRI

Khushboo Bhavsar[1], **Naynaben Vaghani**[2], **Annirudh Gadhavi**[2], **Rajesh Naval**[3]

[1]Ex- Resident, Department of Anaesthesia, C.U.Shah Medical College and Hospital, Surendranagar, Gujarat, India, [2]Assistant Professor, Department of Anaesthesia, C.U.Shah Medical College and Hospital, Surendranagar, Gujarat, India, [3]Professor, Department of Anaesthesia, C.U.Shah Medical College and Hospital, Surendranagar, Gujarat, India.

Abstract

Background: The present research was performed to assess the efficacy and safety of dexmedetomidine versus propofol for sedation in children endures MRI. **Subjects and Method:** This prospective randomized research was performed in the Department of Anaesthesia at Medical College, Surendranagar. Baseline HR, systolic blood pressure (SBP), respiratory rate (RR), and oxygen saturation (SpO2) Onset of sedation were documentated on entrance to the research room. Children were divided in dexmedetomidine (Group D) or propofol (Group P). Group D (n = 30) received injection dexmedetomidine1μg/kg for 10 min trailed by constant Dexmedetomidine 0.5-0.7μg/kg/h. Group P (n = 30) received injection propofol 1 mg/kg bolus trailed by constant infusion of 100 μg/kg/min. Site and duration of MRI, onset of sedation (RSS = 5), duration of sedation, incremental infusion requirement, and recovery time were recorded. **Results:** Mean age, weight, and sex ratio among the two groups were comparable. The mean time to attain the requisite level of sedation was comparable in both the groups The utilization of Dexmedetomidine for postoperative analgesia consequences in considerably fewer added pain medication and sluggish heart rates than a control group. **Conclusion:** Dexmedetomidine is analogous with propofol as maintenance anesthetic agent and it can create improved organize of hemodynamic erratics. Propofol has a benefit of given that quick onset of sedation and faster revival instance.

Keywords: Dexmedetomidine, Propofol, Recovery time, Sedation.

Corresponding Author: Naynaben Vaghani, Assistant Professor, Department of Anaesthesia, C.U.Shah Medical College and Hospital, Surendranagar, Gujarat, India.
E-mail: drnayanasarda@gmail.com

Received: 25 January 2021 **Revised: 13 March 2021** **Accepted: 22 March 2021** **Published: 05 June 2021**

Introduction

Bispectral index (BIS) is a extensively consumption of quantitative parameter for assessing depth of anesthesia.[1] The frequency of magnetic resonance imaging (MRI) has increased in recent years in children; however, it is very sensitive to motion artifacts. This investigation requires children to reside immobile for a changeable time of up to an hour in a attractive, clogged, claustrophobic, and loud surroundings; therefore, a profound level of sedation is requisite during MRI.[2,3]

The accomplishment of sedation for MRI is calculated by 2 factors: The security of the sedation method and the effectiveness of the procedure (successful completion of the diagnostic investigation).

In the past, chloral hydrate and pentobarbital had been the drugs of alternative for pediatric sedation radiological investigations, but the complications associated with them limit their utilization.[4] With time, more drugs such as midazolam and ketamine became popular for sedation in children for diagnostic procedures. Midazolam may grounds utilization paradoxical excitation and demonstration with superior doses while unfavourable effects such as hypertonicity and hypertension are commonly seen with ketamine.[5,6]

Propofol by continuous infusion provides the ability to titrate a required level of sedation and provides a quick revival after infusion is finished. However, propofol can grounds hypotension, respiratory depression, bradycardia, and defeat of protective airway reflexes.[7]

Dexmedetomidine, a strong and extremely discriminating α_{2-} receptor agonist, offers deep levels of sedation with no upsetting cardiovascular and respiratory stability. However, it reason dose-dependent decrease in heart rate (HR) and mean arterial blood pressure.[8]

There are limited studies comparing propofol with dexmedetomidine for technical sedation in children. Hence, we conducted the comparative study of Inj. Dexmeditomedine infusion vs Injection Propofol infusion in MRI.

Subjects and Methods

This prospective randomized research was performed in the Department of Anesthesia at C.U.Shah Medical College, Surendranagar. After local institutional research and Ethical Committee authorization and printed parental consent, a entirety of 60 children aged 2–10 years, having corporeal status 1 or 2 as per ASA, experiences MRI were incorporated in the study.

Exclusion Criteria

- Any known allergies to the study drugs
- Episodes of vomiting, apnea, and active respiratory illness
- Unstable cardiac status
- Anticipated difficult airway

Baseline HR, SBP, RR, SpO_2, Onset of sedation was documented on access to the research room.

Children were divided in dexmedetomidine (Group D) or propofol (Group P).

Group D (n = 30) received injection dexmedetomidine1μg/kg for 10 min trailed by incessant Dexmedetomidine 0.5-0.7μg/kg/h.

Group P (n = 30) received injection propofol 1 mg/kg bolus trailed by incessant infusion of 100 μg/kg/min.

The sedation level of the children was calculated using the Ramsay sedation scale each 1 minitue till a score of 5 was achieved.[9] Children were positioned on the scanning table after a score of 5 was achieved and hemodynamic as well as respiratory constancy was ensure. Thereafter, RSS was measured every 5 min till the imaging was over.

Subjects were approved to breathe impulsively devoid of an artificial airway all through the process. If the SpO_2 level reduces below 93% for 30 s, the imaging procedure was broken up, and the subject was taken out of the MRI tunnel. Following considering airway, the neck was expanded and oxygen given by facemask, and the research drug infusion was withdrawn temporarily. The imaging process was started again once the SpO_2 returned to normal. In the last part of the MRI, the drug infusion was terminating, and the subjects were then relocated to the recovery room.

The quality of the MRI was assessed using a three-point scale (1 = no motion; 2 = minor movement; and 3 = major movement necessitating another scan). Point scale 1 and 2 were considered satisfactory for imaging.

Site and duration of MRI, onset of sedation (RSS = 5), period of sedation, incremental infusion requirement, and recovery time (time in minutes from the last dose of sedation to the point at which patient was discharged) were recorded. Hemodynamic and respiratory parameters such as HR, SBP, SpO_2, and RR were recorded at 5 min interval up to 50 min. Complications such as nautilization a, vomiting, hypotension, bradycardia, respiratory depression, desaturation, and allergic reaction if any were noted. Criteria for bradycardia and hypotension were taken as >20% decrease in HR and SBP from baseline values.[10,11] Respiratory depression was taken as RR <10/min.[12]

Statistical Analysis

Latterly data were composed and analyzed statistically. Intergroup analysis was executed utilizing unpaired Student's t-test. Assessment of continuous data between groups was done using ANOVA. Assessment of definite data among groups was done using Fisher's exact test. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

Table 1: Recovery Time

Variables	Group (n=30)	P	Group D (n=30)
Age(years)			
Mean	3.22		4
SD	1.7		1
Sex			
Male	17		19
Female	13		11
Duration of MRI (min)	25.18+-5.01		23.33+-4.64
Quality of MRI (%)			
1	15		16
2	15		14

Propofol or Dexmedetomidinealone or united with differenct agents are regularly utilized to persuade deep sedation in children for MRI. Mean age, weight, and sex ratio among the two groups were comparable [Table 1]. The distribution of patients according to site, duration, and quality of MRI were comparable in both the groups. The mean time to attain the necessary level of sedation was comparable in both the groups and the quality and ease of control of sedation were superior in all subjects. Agnostic action on alpha2 receptors modulates the release of catecholamines. This technique authorized quick

Table 2: Ramsay Sedation Score

Variables	Group P	Group D	P-value
	Mean±SD	Mean±SD	
Onset of Duration (min)	3.93+-0.6	6.47+-1	0.01*
Duration of Sedation (min)	28.6+-4.61	30.2+-5.26	0.06
Number of Subjects requiring			
Increased Infusion (%)	5	9	
Recovery time (min)	5 +-0.8	8.7+-1	0.5

*** indicates statistically significance at p≤0.05, Test applied chi-square test and unpaired t test**

Table 3: Post-operative Analgesia

Post-operative Analgesia	Group P	Group D
Nautilization a	0	0
Vomiting	0	1
Hypotension	0	0
Bradycardia	0	2
Respiratory Depression	2	0
Oxygen Saturation	2	0
Allergic reaction	0	0

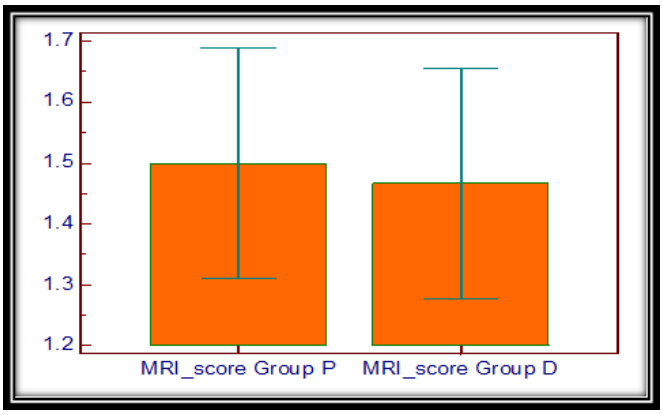

Figure 1: MRI Score

and precise control of the level of Sedation. Sedation was satisfactory and no serious complications were attributed. The utilization of Dexmedetomidine for postoperative analgesia marks in considerably a smaller amount supplementary pain medication and sluggish heart rates than a control group [Table 3].

Discussion

Distinction with propofol and midazolam, dexmedetomidine was as efficient in preserving sufficient sedation for extended mechanical ventilation.[13–16] It has been utilized as solitary anesthetic agent barely in a not many instances,[17,18] while propofol has been utilized to uphold the depth of anesthesia regularly.

Propofol or Dexmedetomidinealone or shared with further agents are often utilized to induce deep sedation in children for MRI. Mean age, weight, and sex ratio among the two groups were comparable. [Table 1] The distribution of patients according to site, duration, and quality of MRI were comparable in both the groups. The mean time to arrive at the necessary level of sedation was comparable in both the groups and the excellence and ease of control of sedation were superior in every subject. The difference being highly significant statistically (P < 0.001). This was found to be in dissimilarity with the research performed by Koroglu et al., where the average onset of sedation was found to be 19 min in patients who received dexmedetomidine.[10] The considerably longer onset of sedation could be attributable to the difference in the end‑point of accepted level of adequate sedation taken as RSS score of 6 in their study.

Recovery time after dexmedetomidine was more than double (P< 0.05) than that after propofol, i.e. 9.02 ±2.99min for dexmedetomidine while 3.52 ± 1.07 min for propofol. These findings are analogous to the research of Arain and Ebert and Heard et al.[19,20]

The mean HR was found to be lower in Group D as compared to Group P, the difference being significant up to 25 min interval (P < 0.05). findings are certain with the findings of

Koroglu et al., who found a highly significant decrease in HR from the baseline during sedation with dexmedetomidine as well as propofol ($P < 0.001$) results are in accordance with the study of Heard et al., who found that the HR throughout the study in the dexmedetomidine group was considerably less than the baseline ($P < 0.001$) Susan Taylor described in their study that Dexmedetomidine infusion consequences in less sedation connected unfavorable measures, perticularlyupper airway obstruction, while propofolis associated with more chances of respiratory depression and loss of reflexes.

Regarding Sedation score it was observe that subjects getting dexmedetomidine were further sedated through postoperative period, but devoid of any impairment of ventilation. These findings were analogous with research by Venn and Grounds who too establish additional sedation with dexmedetomidine postoperatively but with no any stoppage in extubation.[9] The extended sedation with dexmedetomidine could be elucidated by extended abolition half-life of the drug.[21] Except occurrence of deferred revival and longer discharge time with dexmedetomidine were experiential by various investigators.[22–24]

Conclusion

Dexmedetomidine is analogous with propofol as maintenance anesthetic agent and it can create improved control of hemodynamic variables. Propofol has a benefit of given that rapid onset of sedation and earlier revival time.

References

1. Kasuya Y, Govinda R, Rauch S, Mascha EJ, Sessler DI, Turan A. The Correlation Between Bispectral Index and Observational Sedation Scale in Volunteers Sedated with Dexmedetomidine and Propofol. Anesth Analg. 2009;109(6):1811–1815. Available from: https://dx.doi.org/10.1213/ane.0b013e3181c04e58.
2. Lawson; GR. Controversy: Sedation of children for magnetic resonance imaging. Arch Dis Child. 2000;82(2):150–153. Available from: https://dx.doi.org/10.1136/adc.82.2.150.
3. Hasan RA, Shayevitz JR, Patel V. Deep sedation with propofol for children undergoing ambulatory magnetic resonance imaging of the brain: Experience from a pediatric intensive care unit. Pediatr Crit Care Med. 2003;4(4):454–458. Available from: https://dx.doi.org/10.1097/01.pcc.0000090013.66899.33.
4. Mason KP, Sanborn P, Zurakowski D, Karian VE, Connor L, Fontaine PJ, et al. Superiority of Pentobarbital versus Chloral Hydrate for Sedation in Infants during Imaging. Radiology. 2004;230(2):537–542. Available from: https://dx.doi.org/10.1148/radiol.2302030107.
5. Sanborn PA, Michna E, Zurakowski D, Burrows PE, Fontaine PJ, Connor L, et al. Adverse Cardiovascular and Respiratory Events during Sedation of Pediatric Patients for Imaging Examinations. Radiology. 2005;237(1):288–294. Available from: https://dx.doi.org/10.1148/radiol.2371041415.
6. Vardy JM, Dignon N, Mukherjee N, Sami DM, Balachandran G, Taylor S. Audit of the safety and effectiveness of ketamine for procedural sedation in the emergency department. Emerg Med J. 2008;25(9):579–582. Available from: https://dx.doi.org/10.1136/emj.2007.056200.
7. Wilson E, Mackenzie N, Grant IS. A comparison of propofol and midazolam by infusion to provide sedation in patients who receive spinal anaesthesia. Anaesthesia. 1988;43(s1):91–94. Available from: https://dx.doi.org/10.1111/j.1365-2044.1988.tb09084.x.
8. Ramsay MAE, Luterman DL. Dexmedetomidine as a Total Intravenous Anesthetic Agent. Anesthesiology. 2004;101(3):787–790. Available from: https://dx.doi.org/10.1097/00000542-200409000-00028.
9. Hegde A, Joshi AB, Shankaranarayan UR, Manju R. To Compare the Efficacy of Two Intravenous Combinations of Drugs Ketamine–Propofol vs Ketamine–Dexmedetomidine for Sedation in Children Undergoing Dental Treatment. Int J Clin Pediatr Dent . 2021;13(5):529–535. Available from: https://dx.doi.org/10.5005/jp-journals-10005-1826.
10. Koroglu A, Teksan H, Sagr O, Ayta, Toprak HI, Ersoy OM. A Comparison of the Sedative, Hemodynamic, and Respiratory Effects of Dexmedetomidine and Propofol in Children Undergoing Magnetic Resonance Imaging. Anesthesia & Analgesia. 2006;103(1):63–67. Available from: https://dx.doi.org/10.1213/01.ane.0000219592.82598.aa.
11. Mahmoud M, Gunter J, Donnelly LF, Wang Y, Nick TG, Sadhasivam S. A Comparison of Dexmedetomidine with Propofol for Magnetic Resonance Imaging Sleep Studies in Children. Anesthe Analg. 2009;109(3):745–753. Available from: https://dx.doi.org/10.1213/ane.0b013e3181adc506.
12. Arain SR, Ebert TJ. The efficacy, side effects, and recovery characteristics of dexmedetomidine versus propofol when utilization d for intraoperative sedation. Anesth Analg. 2002;95:461–467. Available from: https://doi.org/10.1097/00000539-200208000-00042.
13. Miller DR; 2010.
14. Jakob SM, Ruokonen E, Grounds RM, Sarapohja T, Garratt C, Pocock SJ. Dexmedetomidine vs midazolam or propofol for sedation during prolonged mechanical ventilation: Two randomized controlled trials. JAMA. 2012;307:1151–60. Available from: https://doi.org/10.1001/jama.2012.304.
15. Dutta S, Karol MD, Cohen T, Jones RM, Mant T. Effect of dexmedetomidine on propofol requirements in healthy subjects. J Pharm Sci. 2001;90(2):172–181. Available from: https://dx.doi.org/10.1002/1520-6017(200102)90:2<172::aid-jps8>3.0.co;2-j.
16. Cattano D, Lam NC, Ferrario L, Seitan C, Vahdat K, Wilcox DW, et al. Dexmedetomidine versus Remifentanil for Sedation during Awake Fiberoptic Intubation. Anesthesiol Res Pract. 2012;2012:1–7. Available from: https://dx.doi.org/10.1155/2012/753107.
17. Ramsay MAE, Luterman DL. Dexmedetomidine as a Total Intravenous Anesthetic Agent. Anesthesiology. 2004;101(3):787–790. Available from: https://dx.doi.org/10.1097/00000542-200409000-00028.

18. Shukry M, Kennedy K. Dexmedetomidine as a total intravenous anesthetic in infants. Paediatr Anaesth. 2007;17(6):581–583. Available from: https://doi.org/10.1111/j.1460-9592.2006.02171.x.
19. Arain SR, Ebert TJ. The efficacy, side effects, and recovery characteristics of dexmedetomidine versus propofol when utilization d for intraoperative sedation. Anesth Analg. 2002;95:461–8209. Available from: https://doi.org/10.1097/00000539-200208000-00042.
20. Heard C, Burrows F, Johnson K, Joshi P, Houck J, Lerman J. A Comparison of Dexmedetomidine-Midazolam with Propofol for Maintenance of Anesthesia in Children Undergoing Magnetic Resonance Imaging. Anesth Analg. 2008;107(6):1832–1839. Available from: https://dx.doi.org/10.1213/ane.0b013e31818874ee.
21. Wijeysundera DN, Naik JS, Beattie WS. Alpha-2 adrenergic agonists to prevent perioperative cardiovascular complications:. Am J Med. 2003;114(9):742–752. Available from: https://dx.doi.org/10.1016/s0002-9343(03)00165-7.
22. Bulow NMH, Barbosa NV, Rocha JBT. Opioid consumption in total intravenous anesthesia is reduced with dexmedetomidine: a comparative study with remifentanil in gynecologic videolaparoscopic surgery. J Clin Anesth. 2007;19(4):280–285. Available from: https://dx.doi.org/10.1016/j.jclinane.2007.01.004.
23. Salman N, Uzun S, Coskun F, Salman MA, Salman AE, Aypar U. Dexmedetomidine as a substitute for remifentanil in ambulatory gynecologic laparoscopic surgery. Saudi Med J. 2009;30:77–81.
24. Turgut N, Turkmen A, Ali A, Altan A. Remifentanil-propofol vs dexmedetomidine-propofol - anesthesia for supratentorial craniotomy. Middle East J Anesthesiol. 2009;20:63–70.

How to cite this article: Bhavsar K, Vaghani N, Gadhavi A, Naval R. Evaluation of the Efficacy and Safety of Dexmedetomidine versus Propofol for Sedation in Children Undergoing MRI. Acad. Anesthesiol. Int. 2021;6(1):101-105.

DOI: dx.doi.org/10.21276/aan.2021.6.1.18

Source of Support: Nil, **Conflict of Interest:** None declared.