Original research article

The impact of intravenous dexmedetomidine on anaesthesia depth in people who are undergoing a lower segment caesarean delivery while under general anaesthesia.

Dr. Nitin Kumar[1], Dr. Rishi Kant[2], Dr. Priyanka Singh[3], Dr.Rajesh Verma[4]

[1]Junior Resident (Academic), Department of Anaesthesiology, Patna Medical College and Hospital, Patna, Bihar, India

[2]Junior Resident (Academic), Department of Anaesthesiology, Patna Medical College and Hospital, Patna, Bihar, India

[3]Junior Resident (Academic), Department of Anaesthesiology, Patna Medical College and Hospital, Patna, Bihar, India

[4]Associate Professor, Department of Anaesthesiology, Patna Medical College and Hospital, Patna, Bihar, India.

Corresponding Author: Dr. Rishi Kant

Abstract

Aim: To evaluate the effect of Intravenous dexmedetomidine on depth of anaesthesia in patients undergoing lower segment cesarean section under general anaesthesia.

Methods: This prospective observational study was carried out in the Department of Anaesthesiology, Patna Medical College and Hospital, Patna, Bihar, India for 15 months. We included 80 full term parturients in the age group 18-32 years who were posted for elective cesarean section for different indications under General Anaesthesia. They weredivided into 2 groups by sealed enveloped technique to receive 1mcg/kg IV dexmedetomidine 10 minutes before induction (Group A) (n=40) or to not receive dexmedetomidine, control group (Group B) (n=40).

Results: Comparing awareness in both group, in Group A the BISscore was around 47-67 and in Group B BIS score was around 60-86, with statistically significant value of $P < 0.05$. No statistical difference between both groups in Apgar score ($P > 0.05$).

Conclusion: The loading dose of IV dexmeditomidine 1mcg/kg is effective in aborting awareness without affecting APGAR score.

Keywords: dexmeditomidine, cesarean section, anaesthesia

Introduction

Awareness is a serious complication during general anesthesia. It causes adverse psychological sequelae which may lead to postoperative behaviour modification.[1] Prevention of pain and awareness during general anesthesia is the major mission of the anesthesiologists. This can be achieved adequate balanced anesthesia using hypnotic, analgesic, and amnesic drugs.[2] There is increased incidence of awareness during general anesthesia for Cesarean section due to rapid sequence induction, avoidance of opioid analgesics and amnesic drugs until the fetal delivery, and the limited concentration of volatile agents.[3,4] This can increase the incidence of post-traumatic stress disorder among these patients. Achievement of adequate depth of anesthesia is an important goal and as such merits more research work.[5] The current approach for evaluating the depth of anesthesia is the assessment of hemodynamics and subjective signs like movement, sweating, and lacrimation, but these are not adequately sensitive or specific.[6] The Bispectral Index (BIS) is an adequately sensitive FDA-approved method for the evaluation of

the depth of anesthesia by processing the patient's electroencephalogram (EEG).[7] Accordingly, the BIS can be used to prevent intraoperative awareness in surgeries with increased risk of light anesthesia like C/S.[3] Dexmedetomidine(DEX) is a highly selective alpha II receptor agonist with many actions like; sedation and analgesia.[8] Dexmedetomidine provides hemodynamic stability, so it can be used as a sedative during surgical and other procedures in nonintubated patients.[9] In 2009, dexmedetomidine has been used safely during normal labour as it provides stability of maternal hemodynamics, sedation, ecbolic effect and less incidence of fetal distress due to its high placental retention.[10] Several Studies have recommended that DEX is safe and effective when used as an adjuvant for general anesthesia with a loading dose of 0.5–1 μg/kg and 0.5–1.0 μg kg−1 min−1 infusion during intravenous or volatile agents.[11]

Material and methods

This prospective observational study was carried out in the Department of Anaesthesiology, Patna Medical College and Hospital, Patna, Bihar, India for 15 months. after taking the approval of the protocol review committee and institutional ethics committee. We included 80 full term parturients in the age group 18-32 years who were posted for elective cesarean section for different indications under General Anaesthesia. They were divided into 2 groups by sealed envelope technique to receive 1mcg/kg IV dexmedetomidine 10 minutes before induction (Group A) (n=40) or to not receive dexmedetomidine, control group (Group B) (n=40). Patients with medical illness excluding PIH /severe renal, hepatic, cardiac illness, neurological disease, allergy to dexmedetomidine and fetal compromise were excluded from the study. Demographic data were recorded including maternal age & body weight for prophylaxis against aspiration, Inj. ranitidine 50 mg & Inj. perinorm 10mg i.v. Were given 30 minutes before induction. Monitoring was done using ECG, NIBP, pulse oximetry, BIS monitor. The person, who supervised the anaesthesia, explained the concept of study to patients and placed sphygmomanometer cuff around the Right arm of the patients after placing the cotton bandage and inflated it to 200 mm Hg immediately before induction. This technique isolated the Right sidearm from the effects of Neuromuscular blocking agents. Then the patient was presented with command, "open and close your Right hand". This was done every thirty seconds throughout the procedure till extubation. The cuff was deflated every twenty minutes to prevent ischemic paralysis. After three minutes of Preoxygenation, after adequate premedication with Inj. Glyco 0.2mg, Rapid Sequence Induction performed with Inj. thiopentone 4-5 mg/kg and Inj.suxa 1-2mg/kg. Cricoid pressure then applied and patient intubated appropriate sized endotracheal tube. Anaesthesia was maintained with 50% N2 0 and 50% O2 and sevoflurane with concentration of 0.5 – 1 %, until delivery. After delivery of the baby, Inj.fentanyl 100mcg IV & Inj.midazolam 0.3mg/kg given. Sevoflurane administration stopped at start of closure of subcutaneous and N2O was then stopped at start of closure of skin. BIS values & Isolated forearm responses were monitored. Apgar score was also recorded.

Results

Demographic data showed no significant difference between two groups. table 1.

Table 1: Demographic data distribution between the two groups A &B

	Group a	Group b	'p' value
Age	25.78±5.85	26.9±4.98	0.47
Weight	52.26±11.36	53.98±11.76	0.26

Comparing awareness in both group, in Group A the BISscore was around 47-67 and in Group B BIS score was around 60-86, with statistically significant value of $P < 0.05$. BIS Scores recorded during various period of the procedurein both Groups A and B shown in table 2.

Table 2: BIS values recorded during various period in bothGroups A and B

Parameter	DEX	NX
Base	90	90
Induction	37	58
Intubation	42	63
SI	47	67
Delivery	57	72
Close	65	77
Extubation	77	87

Table 3: Apgar Score between two groups A & B

APGAR Score	DEX	NX
1 min	7	7
5min	8	8

No statistical difference between both groups in Apgar score (P>0.05)(Table 3)

Table 4: Isolated forearm Test Response obtained in Group A &B

IFT	Response
Group A	6(15%)
Group B	29(72.5%)
P value	<0.05

Negative isolated arm response in Group A, positive response obtained in Group B.

Table 5: Systolic BP variation recorded in Group A & B

Parameter	DEX	Placebo
Base	88	84
Induction	79	88
Delivery	89	96
Extubation	90	97

Table 6: HR Variation recorded in Group A & B

Parameter	DEX	Placebo
Base	83	84
Induction	68	73
Delivery	80	88
Extubation	82	93

Haemodynamic variables recorded during the entire anaesthesia procedure in both groups shown in table. 5 and 6.

Discussion

In this study, it was found that dexmedetomidine succeededsignificantly in aborting awareness & maintaining hemo dynamic stability & didn't affect the APGARscore.[12,13]

Studies on the use of dexmedetomidine for cesarean section are sparse.[14-16] Dexmedetomidine, under the trade name Precedex among others, is an anxiety reducing, sedative, and also as an analgesic sometimes. Its is notable for its abilityto produce sedation without producing much respiratory depression (unlike propofol, fentanyl and midazolam) and can provide cooperative or semi-arousable sedation.[17]

Dexmedetomidine excite the presynaptic α_2 -AR, inhibitor reduce Norepinephrine release & stop pain signal transduction. It also excite postsynaptic α_2 -AR, lead to hyperpolarisation

of neural cell Membrane& inhibit Norepinephrine release & inhibit sympathetic activity. Dexmedetomidine excites the presynaptic α_2 -AR of the nucleus ceruleus arousal response.

α2-Adrenergic Receptor agonists like dexmedetomidineproduce clinical effects after binding to G-Protein-coupled α2 adrenergic receptors, of which there are three alpha subtypes (A, B, and C) with each having different physiological functions and pharmacological activities. These subtypes are found in peripheral, central, and autonomic nervous systems, as well as in major organs andblood vessels. [17]

Dexmedetomidine is d-enantiomer of medetomidine with highly selective alpha2 action (alpha2:alpha1=1600:1).Neither dexmedetomidine nor clonidine is totally selective for any of the α2receptor sub types, but dexmedetomidine seems to have increased α2Areceptor and α2C receptor affinity compared to clonidine.[18]

Locus ceruleus of the brain stem is responsible for the sedative action, and spinal cord is the principal site forthe analgesic action, both acting through α2A receptor. [19]

In the heart, the predominant action of α2 adrenergic receptor is a decrease in heart rate through blocking cardio accelerator nerve through subtype 2A and through vago mimetic action. In the peripheral vascular tissues, there is sympatholytic induced vasodilatation and smooth muscle receptor mediated vasoconstriction. Finding out whether a patient is conscious or awake while undergoing general anesthesia pose a major problem.20 The limitations of current clinical methods to assess anesthetic adequacy have been well known. Mechanisms in the central nervous system that control higher functions like memory and consciousness may be anesthetized adequately, whereas spinal cord mechanisms that suppress movement to surgical stimulus may not be anaesthetised adequately. A direct method of evaluating consciousness is needed, rather than the current practice of monitoring hemodynamic changes or movement responses. A machine or monitor that measures physiologic changes associated with the conscious state would be an improvement on current methods, which are dependent on responses that only indirectly reflect consciousness. The bispectral monitoring system, an Electroencephalogram derived data was introduced for clinical use in October 1996, as a technique for measuring depth of anaesthesia induced by hypnotics and sedatives and as a guide for the administration of various drugs intraoperatively.[21,22] Its use in clinical practice is increasing all over the world to prevent intraoperative awareness and is also recognised beyond the operating room to critical care units, accident and emergency units. The isolated forearm technique, was originally described by Tunstall, in contrast to BIS detects the return of consciousness. [23,24]

Conclusion

We concluded that loading dose of IV dexmeditomidine 1mcg/kg is effective in aborting awareness without affecting APGAR score. Dexmedetomidine, when given as a pre-anaesthetic medication and intraoperative infusion, decreases stress response to various noxious stimuli and maintains haemodynamic stability.

Reference

1. Rampersad SE, Mulroy MF. A case of awareness despite an adequate depth of anesthesia as indicated by a Bispectral Index® monitor. Anesth Analg 2005;100(5):1363–4.
2. Grover V, Bharti N. Measuring depth of anaesthesia-an overview on the currently available monitoring systems. In: The Indian Anaesthetists' Forum; 2008.

3. Hadavi SMR, Allahyary E, Asadi S. Evaluation of the adequacy of general anesthesia in cesarean section by bispectral index. Iran J Med Sci 2013;38(3):240.
4. Chin K, Yeo S. A BIS-guided study of sevoflurane requirements for adequate depth of anaesthesia in Caesarean section. Anaesthesia 2004;59(11):1064–8.
5. Kalkman CJ, Drummond JC. Monitors of depth of anesthesia, quo vadis? Anesthesiology 2002;96(4):784–7.
6. Robins K, Lyons G. Intraoperative awareness during general anesthesia for cesarean delivery. Anesth Analg 2009;109(3):886–90.
7. Chung AL, Kim DY, Lee HS, et al. The effect of using sevoflurane for cesarean section on the bispectral index (BIS) and on neonates. Kor J Anesthesiol 2004;47(2):188–91.
8. Grewal A. Dexmedetomidine: new avenues. J Anaesthesiol Clin Pharmacol 2011;27(3):297.
9. Shukry M, Miller JA. Update on dexmedetomidine: use in nonintubated patients requiring sedation for surgical procedures. Ther Clin Risk Manage 2010;6:111.
10. Abu-Halaweh SA, Al Oweidi A-KS, Abu-Malooh H. Intravenous dexmedetomidine infusion for labour analgesia in patient with preeclampsia. Eur J Anaesthesiol 2009;26(1):86–7.
11. Kang W-S, Kim S-Y, Son J-C, et al. The effect of dexmedetomidine on the adjuvant propofol requirement and intraoperative hemodynamics during remifentanil-based anesthesia. Korean J Anesthesiol 2012;62(2):113–8
12. Keniya VM, Ladi S, Naphade R. Dexmedetomidine attenuates sym- pathoadrenal response to tracheal intubation and reduces perioperative anaesthetic requirement. Indian J Anaesth. 2011;55:352–357.
13. Patel CR, Engineer SR, Shah BJ. Effect of intravenous infusion of dexmedetomidine on perioperative haemodynamic changes and postoperative recovery: A study with entropy analysis. Indian J Anaesth. 2012;56:542–546.
14. Blaudszun G, Nair AS, Sriprakash K. Dexmedetomidine in pregnancy: Review of literature and possible use. J Obstetr Anaesth Crit Care. 2013;3:3–3.
15. Abu-Halaweh SA, Oweidi AI, A-Ks, Zabalawi M, Alkazaleh F, et al. Comparative Evaluation of Remifentanil and Dexmedetomidine in General Anesthesia for Cesarean Delivery. Eur J Anaesthesiol. 2009;26:86–87.
16. Neumann MM, Davio MB, Macknet MR. Dexmedetomidine for awake fiberoptic intubation in a parturient with spinal muscular atrophy type III for cesarean delivery. Int J Obstet Anesth. 2009;18:403–407.
17. T K, Maze M. Clinical uses of alpha2 -adrenergic agonists. Anaesthesiol. 2000;93:1345–1349.
18. Savola JM, Ruskoaho H, Puurunen J, Salonen JS, Krki NT. Evidence for medetomidine as a selective and potent agonist at alpha 2- adrenoreceptors. J Auton Pharmacol. 1986;6:275–284.
19. Lysakowski C, N E, Tramer MR. Effect of Perioperative Systemic 2 Agonists on Postoperative Morphine Consumption and Pain Intensity: Systematic Review and Meta-analysis of Randomized Controlled Trials. 2012;116:1312–1322.
20. Russell IF: Conscious awareness during general anesthesia, Depth of anesthesia, Baillire's Clinical Anesthesiology. Bailliere Tindall ; 1989,. p. 511–532.
21. Avidan MS, Zhang L, Burnside BA. Anesthesia awareness and the bispectral index. N Engl J Med. 2008;358:1097–1108.
22. Myles PS, Leslie K, Mcneil J, Forbes A, Chan MT. Bispectral index monitoring to prevent awareness during anaesthesia: the B-Aware randomised controlledtrial. Lancet. 2004;363:1757–1763.

23. Breckenridge JL, Aitkenhead AR. Isolated forearm technique for detection of wakefulness during general anesthesia. Br J Anaesth. 1981;53:665–666.
24. Tunstall ME. Awareness, caesarean section and the isolated forearm technique. Anaesth. 1990;45:686

Received: 12-08-2020 // Revised: 29-08-2020 // Accepted: 22-09-2020