

Role of Dexmedetomidine in Obstetric Anaesthesia & Analgesia

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Abstract

Dexmedetomidine is a highly selective α -2 adrenergic receptor agonist which when used in recommended dose in the form of an infusion has several desirable properties like sedation, anxiolysis, sympatholysis, analgesia, stimulation of uterine contractions, decreased intraoperative anaesthetic requirements. It was approved by United States Food and Drug Administration [US FDA] in 1999 for use in humans for short-term sedation and analgesia in Intensive Care Unit [ICU] for less than 24 hours. 140 female patients were divided into three groups, 40 patients were included in the first group Intravenous infusion of [dexmedetomidine versus pethidine in continuous intravenous infusion at the start of active labor at cervical dilatation 4 cm], 60 patients were included in the second group comparative study between Intrathecal [Dexmedetomidine+ Bupivacaine] versus [Fentanyl + Bupivacaine] versus [Bupivacaine] in LSCS, and 40 patients were included in the third group comparative study between intravenous dexmedetomidine infusions versus magnesium sulphate infusion in preeclampsia patients. Regarding to the first group there were significant difference between VAS of group Ia [4.80 ± 0.62] compared to group Ib [5.75 ± 1.07], and the second group there was highly significance between the groups IIa, IIb & IIc regarding VAS as group IIa [3.75 ± 1.16], group IIb [5.20 ± 1.32], group IIc [5.85 ± 1.84] there was highly significance regarding onset of motor block between these 3 groups As [group IIa [6.675 ± 1.18], group IIb [7.32 ± 1.66], group IIc [9.12 ± 1.58]], There was highly significance also between 3 groups regarding onset of sensory block As [group IIa [7.85 ± 1.06], group IIb [8.70 ± 1.62], group IIc [10.50 ± 1.88]], There was significance between 3 groups regarding sensory block duration As [group IIa [189.43 ± 84.39], group IIb [160.70 ± 68.62], group IIc [116.73 ± 48.60]], and the third group there was significance regarding uterine contraction between group IIIa & group IIIb As group IIIa [2.50 ± 0.69] group IIIb [1.60 ± 0.99], and there was significance between group IIIa & group IIIb regarding APGAR score as group IIIa [9.35 ± 0.67] & group IIIb [8.25 ± 1.21]. In conclusion dexmedetomidine is the best as multiuse drug for analgesia in normal labor by intravenous infusion & analgesia and Anaesthesia of cesarean section by intrathecal injection & analgesia and Anaesthesia for preeclampsia.

Keywords: Dexmedetomidine, Obstetric Anaesthesia, Obstetric Analgesia.

1. Introduction

Dexmedetomidine is An Exceptionally particular α -2 adrenergic receptor agonist which when utilized within proposed measurements in the manifestation about a implantation need a few alluring properties like sedation, anxiolysis, sympatholysis, analgesia, incitement about uterine contractions, diminished intraoperative soporific prerequisites [Narcotic, inhalational], cardiovascular stability, smooth birch recuperation when utilized as a assistant to general anesthesia Also most importantly preserves respiratory capacity. It might have been endorsed by united states sustenance What's more pill organization [US FDA] to 1999 to use for people to fleeting sedation Furthermore absence of pain over seriousness [ICU] to under 24 hours. There are a few case reports describing great utilization of dexmedetomidine Previously, Labor absence of pain whether territorial might have been contraindicated, whether tolerant not ready to work epidural or Likewise a assistant should work epidural if agony easing might have been not satisfactory, without any unfriendly fetal results in the prescribed doses [1 μ g/kg stacking dosage over 10–15 minutes emulated Toward an implantation during 0. 2–0. 7 μ g/kg/hour] [1]. Those pain relieving properties of dexmedetomidine clinched alongside people are All the more dubious. It need been recommended that the spinal line may be most likely the significant webpage for pain relieving activity about α -2 adrenoceptor agonists. It gives the idea will push pain relieving impacts In those spinal line level and during supraspinal destinations. Dexmedetomidine might

additionally furnish antinociception through non-spinal instruments intra-articular organization Throughout knee surgery enhances postoperative analgesia, for lesquerella sedation over those iv course [2].

2. Material and methods

Prospective, comparative, single blind randomized study was utilized in the current study. The study sample was divided into three groups as the following:

2.1 The first group

Intravenous infusion of [dexmedetomidine versus pethidine in continuous intravenous infusion at the start of active labor at cervical dilatation 4 cm]: Group Ia: The first 20 patients who will receive intravenous infusion of dexmedetomidine by [0.2-0.7 μ g/kg/hour]. Group Ib: The following 20 patients who will receive pethidine in continuous intravenous infusion by 1.5 mg/kg/24h. Pulse oximetry [SpO₂], non-invasive blood pressure [NIBP], respiratory rate, Visual analogue scale [VAS], and Apgar score were recorded.

2.2 The second group

Intrathecal [Dexmedetomidine+ Bupivacaine] versus [Fentanyl + Bupivacaine] versus [Bupivacaine] in LSCS. Group IIa: The first 20 consecutive patients satisfying the inclusion criteria and who received Intrathecal 0.5% hyperbaric bupivacaine 15mg+5 mcg dexmedetomidine. Group IIb: The second 20 consecutive patients satisfying the inclusion criteria and who received Intrathecal 0.5% hyperbaric bupivacaine 15mg+25 mcg fentanyl .Group

IIC: The third 20 consecutive patients satisfying the inclusion criteria and who received Intrathecal 0.5% bupivacaine [heavy] 15 mg. pulse oximetry, and noninvasive blood pressure, Visual analogue scale, heart rate [HR], Side effects, onset of analgesia, and degree of motor blockade were recorded.

2.3 Third group

Intravenous dexmedetomidine infusions versus magnesium sulphate infusion in preeclampsia patients: Group IIIa: The first 20 consecutive patients satisfying the inclusion criteria and who received 0.4 µg/kg/h intravenous dexmedetomidine. Group IIIb: The second 20 consecutive patients satisfying the inclusion criteria and who received 4 gm loading dose administered over 15 minutes followed by a maintenance dose of 1-2 gm/hr. maternal heart rate, mean blood pressure, The uterine contraction after placental delivery, and Apgar score of the neonates.

3. Results and discussion

3.1 The first group

There were no statistical significant differences in the two groups as regard mean arterial blood pressure at baseline MAP, MAP 30, MAP 60, MAP 90 and MAP 120 Table [1]. there were no statistical significant differences in the two groups as regard mean heart rate at baseline HR, HR 90 and HR 120. Mean HR 30 in group Ia was significantly lower than mean HR in group I b [73.00±7.61 vs 81.10±9.66] respectively. There was significant difference between mean HR 60 in group Ia [76.00±7.36] compared to group I b [82.45±9.30] table [2]. There were significant difference between VAS of group Ia [4.80 ± 0.62] compared to group Ib [5.75 ± 1.07] Table (3).

3.2 The second group

there were no significant differences between 3 groups IIa, IIb & IIc regarding MAP at base line MAP, MAP40, MAP90, MAP120 But there were significant difference between 3 groups regarding MAP at MAP20 [group IIa [83.45 ±11.81], group IIb [85.35±10.09], group IIc [76.90±9.47]] And also there were significant difference between these groups regarding MAP at MAP60 [group IIa [84.20±10.25], group IIb [85.85±10.06], group IIc [78.25 ±9.56]] table [4]. There was highly significance between the groups IIa, IIb & IIc regarding VAS as group IIa [3.75±1.16], group IIb [5.20 ±1.32], group IIc [5.85 ±1.84] Table [5]. there was significant association between postoperative nausea and vomiting and induction of dexmedetomidine, where patients complained postoperative nausea were present at significant higher percent in group IIb [35.0%] and group IIc [35.0%] compared to group II a [5.0%] [P=0.04]. Five percent of group II a complained postoperative vomiting which is significantly lower compared to group II b [40.0%] and group II c [25.0%] [P=0.03] table [6]. There was highly significance regarding onset of motor block between these 3 groups As [group IIa [6.675±1.18], group IIb [7.32±1.66], group

IIc [9.12±1.58]], there was highly significance also between 3 groups regarding onset of sensory block As [group IIa [7.85±1.06], group IIb [8.70±1.62], group IIc [10.50±1.88], and there was significance between 3 groups regarding sensory block duration As [group IIa [189.43±84.39], group IIb [160.70±68.62], group IIc [116.73±48.60] Table (7).

3.3 The third group

There was significance regarding uterine contraction between group IIIa & group IIIb As group IIIa [2.50 ± 0.69] group IIIb [1.60 ± 0.99] Table [8]. There was significance between group IIIa & group IIIb regarding Apgar score as group IIIa [9.35 ± 0.67] & group IIIb [8.25 ± 1.21] Table [9].

In our study group Ia patients received intravenous infusion of dexmedetomidine by [0.2-0.7 µg/kg/hour] demonstrated improvement in pain score which measured by VAS scale than the group Ib and this results was supported with the study of Abdalla, Ammar, & Tharwat, [2015] entitled with Combination of dexmedetomidine and remifentanyl for labor analgesia: A double-blinded, randomized, controlled study which demonstrated positive effect of dexmedetomidine on the pain score.

In the current study group Ia patients received intravenous infusion of dexmedetomidine by [0.2-0.7 µg/kg/hour] demonstrated improvement in pain score which measured by VAS scale than the group Ib and this results was supported with the study of Abdalla, Ammar, & Tharwat, [2015] [3] entitled with Combination of dexmedetomidine and remifentanyl for labor analgesia: A double-blinded, randomized, controlled study which demonstrated positive effect of dexmedetomidine on the pain score. There was no difference between two groups in sedation effect which measured by Ramsay Sedation Scale [RSS]. As regard to Neonatal Apgar score of the group I also there was no difference between group Ia and group Ib as demonstrated in the study results also this results was reported at the study entitled as A double-blinded, randomized, controlled study which demonstrated positive effect of dexmedetomidine on the pain score Abdalla, Ammar, & Tharwat, 2015.

As regard to Sensory and motor block onset times, there was high significant difference between three subgroups of group II in motor block onset time and sensory block onset time, also there was significant difference in duration of sensory block between three subgroups which prove that dexmedetomidine has potent positive effect on motor block onset time, sensory block onset time, and duration of sensory block. As mentioned at the study of Nasr, Elokda. 2015 in the research entitled as Safety and efficacy of intrathecal adjuvants for caesarean section that, dexmedetomidine had positive effect on sensory block onset time. [4].

Li. mentioned at the study entitled as Comparison of Intrathecal Dexmedetomidine with Morphine as Adjuvants in Caesarean Sections that the group who received dexmedetomidine attained a significantly shorter onset time and showed a longer duration of

sensory and motor block than the other groups [5]. Also as reported at the study entitled as A prospective randomized double blind study of intrathecal fentanyl and dexmedetomidine added to low dose bupivacaine for spinal anesthesia for lower abdominal surgeries that, there was highly significant [$P = 0.000$]. The mean time to reach peak sensory block level [Group Fentanyl/group Dexa = 11.88/12.92 min] was statistically significant [$P < 0.05$] [Nayagam, Singh & Singh. 2014] [6].

In our study regarding mean arterial pressure showed that there was significant difference between dexmedetomidine and mgso4 in lowering the blood pressure after 20 minutes and there was high significant difference between two groups after 60 and 120 minutes of IV administration so the group of dexmedetomidine had lower blood pressure than the group of mgso4. And those findings was supported with the results of the study entitled as a comparative study of infusion dexmedetomidine and infusion magnesium sulphate on attenuation of blood pressure surge in laparoscopic surgery under general anaesthesia as reported after starting and up to 40 minutes, MAP significantly lower with dexmedetomidine than with magnesium sulphate [Mallick, Sawika, Chakraborty, Ghosh, & Choudhuri .2019] [7].

As regard to arterial oxygen saturation of the group iii of our study results there was no significant difference between group iia and group iib. and the same results was demonstrated at the study entitled as comparative

study of intravenously administered clonidine and magnesium sulfate on hemodynamic responses during laparoscopic surgeries [Kabilan, Rani . 2017] [8].

Heart rate in group IIIa who received dexmedetomidine in loading dose 1 $\mu\text{g}/\text{kg}$ then intravenous infusion of 0.4 $\mu\text{g}/\text{kg}/\text{h}$ demonstrated low heart rate than the group IIIb who received mgso4 in loading dose 4 gm administered over 15 minutes followed by a maintenance dose of 1 gm/hr. And the same resulted mentioned by Mallick, Sawika, Chakraborty, Ghosh, & Choudhuri .2019 at the study entitled as a comparative study of infusion dexmedetomidine and infusion magnesium sulphate on attenuation of blood pressure surge in laparoscopic surgery under general anaesthesia, up to 40 minutes of, H.R. was found to be significantly lower in dexmedetomidine than magnesium sulphate.

According to our study findings, uterine contraction was improved in group IIIb who received mgso4 in loading dose 4 gm administered over 15 minutes followed by a maintenance dose of 1 gm/hr than group IIIa who received dexmedetomidine in loading dose 1 $\mu\text{g}/\text{kg}$ then intravenous infusion of 0.4 $\mu\text{g}/\text{kg}/\text{h}$. Also Neonatal Apgar score was improved in group IIIa who received dexmedetomidine in loading dose 1 $\mu\text{g}/\text{kg}$ then intravenous infusion of 0.4 $\mu\text{g}/\text{kg}/\text{h}$. than group IIIb who received mgso4 in loading dose 4 gm administered over 15 minutes followed by a maintenance dose of 1 gm/hr.

Table (1) Mean arterial Pressure of the group I.

Variable	Group I a[N=20]	Group I b[N=20]	t	P
	Mean \pm SD	Mean \pm SD		
MAP 0[mmHg]	84.35 \pm 10.36	84.50 \pm 10.57	0.045	0.96
MAP 30[mmHg]	81.75 \pm 10.84	84.35 \pm 9.95	0.079	0.43
MAP 60[mmHg]	81.75 \pm 10.50	84.20 \pm 10.96	0.604	0.55
MAP 90[mmHg]	83.65 \pm 10.14	84.50 \pm 10.95	0.255	0.80
MAP 120[mmHg]	84.00 \pm 10.68	84.55 \pm 10.41	0.165	0.87

Table (2) Heart rate of the group I.

Variable	Group I a[N=20]	Group I b[N=20]	t	P
	Mean \pm SD	Mean \pm SD		
HR 0 [beat/min]	82.90 \pm 9.08	82.70 \pm 9.60	0.068	0.95
HR 30 [beat/min]	73.00 \pm 7.61	81.10 \pm 9.66	2.94	0.005[S]
HR 60 [beat/min]	76.00 \pm 7.36	82.45 \pm 9.30	2.43	0.02[S]
HR 90 [beat/min]	78.95 \pm 78.95	83.50 \pm 9.12	1.71	0.09
HR 120 [beat/min]	81.90 \pm 8.26	83.20 \pm 9.08	0.474	0.63

Table (3) Visual analogue scale [VAS] and Ramsay Sedation Scale [RSS] of the group I.

Characteristics	Group I a[N=20]	Group I b[N=20]	t	P
	Mean \pm SD	Mean \pm SD		
VAS	4.80 \pm 0.62	5.75 \pm 1.07	3.44	0.001[S]
RSS	2.65 \pm 0.87	2.15 \pm 0.93	1.74	0.08

Table (4) Mean arterial Pressure of the group II.
Table [11]: Mean arterial Pressure of the group II.

Variable	Group II a[N=20]	Group II b[N=20]	Group II c [N=20]	F	P
	Mean ± SD	Mean ± SD	Mean ± SD		
MAP 0 [mmHg]	85.90±11.63	87.90 ±10.35	82.80±10.28	1.138	0.32
MAP 20 [mmHg]	83.45 ±11.81	85.35±10.09	76.90±9.47	3.562	0.03[S]
MAP 40 [mmHg]	82.65 ±11.47	84.20 ±10.35	76.55 ±9.26	3.025	0.05
MAP 60 [mmHg]	84.20±10.25	85.85±10.06	78.25 ±9.56	3.221	0.04[S]
MAP 90 [mmHg]	85.45 ±11.12	87.00± 9.79	80.45±10.01	2.199	0.12
MAP 120[mmHg]	87.25±11.57	88.30±10.21	82.25 ±9.99	1.856	0.16

Table (5) Visual analogue scale [VAS] of the group II

Variable	Group II a	Group II b	Group II c	F	P
	[N=20]	[N=20]	[N=20]		
	Mean ± SD	Mean ± SD	Mean ± SD		
VAS analgesia	3.75±1.16	5.20 ±1.32	5.85 ±1.84	10.66	<0.001 [HS]

Table (6) Comparison of the post-operative side effects among group II a, II b and II c

Variable		Group II a		Group II b		Group II c		X ² /FET	P
		[N=20]		[N=20]		[N=20]			
		No.	%	No.	%	No.	%		
Nausea	Present	1	5.0	7	35.0	7	35.0	6.40	0.04
	Absent	19	95.0	13	65.0	13	65.0		
Vomiting	Present	1	5.0	8	40.0	5	25.0	6.89	0.03
	Absent	19	95.0	12	60.0	15	75.0		
Pruritus	Present	2	10.0	3	15.0	6	30.0	2.89	0.23
	Absent	18	90.0	17	85.0	14	70.0		

Table (7) Sensory and motor block onset times [min] in group II a [Bupivacaine + dexmedetomidine], II b [Bupivacaine +fentanyl] and II c [Bupivacaine] Intrathecal.

Time/min.	Group II a	Group II b	Group II c	F	P
	[N=20]	[N=20]	[N=20]		
	Mean ± SD	Mean ± SD	Mean ± SD		
Motor block onset time	6.675±1.18	7.32±1.66	9.12±1.58	14.55	<0.001[HS]
Sensory block onset time	7.85±1.06	8.70±1.62	10.50±1.88	15.04	<0.001[HS]
Duration of sensory block	189.43±84.39	160.70±68.62	116.73±48.60	5.67	0.006[S]

Table (8) Uterine contraction of the group III

Characteristics	Group III a[N=20]	Group III b[N=20]	t	P
	Mean ± SD	Mean ± SD		
uterine contraction	2.50 ± 0.69	1.60 ±0.99	3.32	0.002[S]

Table (9) Neonatal Apgar score of the group III

Characteristics	Group III a[N=20]			Group III b[N=20]			MW-U U	P
	Mean ± SD	Median	range	Mean ± SD	Median	range		
Apgar score	9.35 ± 0.67	9.00	8-10	8.25 ± 1.21	8.00	6-10	94.00	0.004 [S]

4. Conclusion

Dexmedetomidine is the best as multiuse drug for analgesia in normal labour by intravenous infusion & analgesia and anaesthesia of cesarean section by intrathecal injection & analgesia and anaesthesia for preeclampsia. Parenteral opioids and sedatives are the most frequently prescribed agents for women in labour in many poor resource settings. These have shown poor pain relief and a lot of side effects in both the mother and the foetus. In patients with severe pre-eclampsia who are already hemodynamically compromised labour pains and delivery can result in hemodynamic instability, which can compromise both the mother and the neonate. Dexmedetomidine is a highly selective α -2 agonist, which when used in recommended dose in the form of an infusion or as adjuvant to local anaesthesia BY intrathecal injection, has several desirable properties like sedation, anxiolysis, sympatholysis, analgesia, decreased anaesthetic requirements, maintains cardiovascular stability and provides a smooth recovery.

References

- [1] P. Kaur, A. Singla, Introduction and Physiological Changes. A Practical Guide to Third Trimester of Pregnancy and Puerperium, 11–11. doi, Vol. 10 PP. 5005/jp/books/12870_3, 2016.
- [2] R. R. Al-Metwalli, H. A. Mowafi, S. A. Ismail, Effect of intra-articular dexmedetomidine on postoperative analgesia after arthroscopic knee surgery, Br J Anaesth Vol. 101, PP. 395–399, 2008.
- [3] W. Abdalla, M. Ammar, A. Tharwat, Combination of dexmedetomidine and remifentanyl for labor analgesia, A double-blinded, randomized, controlled study, Saudi Journal of Anaesthesia, 9[4], 433. doi, Vol. 10.4103/1658-354x. PP. 159470, 2015.
- [4] I. Nasr, S. Elokda, Safety and efficacy of intrathecal adjuvants for cesarean section, bupivacaine, sufentanil, or dexmedetomidine, Ain-Shams Journal of Anaesthesiology, 8[3], 388. Doi, Vol. 10.4103/1687-7934. PP. 159002. 2015.
- [5] Y. Li, Comparison of Intrathecal Dexmedetomidine with Morphine as Adjuvants in Cesarean Sections, Biological, Pharmaceutical Bulletin Biological and Pharmaceutical Bulletin, 39[9], 1455–1460. Doi, Vol. 10. PP. 1248 /bpb.b16-00145, 2016.
- [6] H. Nayagam, N. Singh, & H. Singh, A prospective randomised double blind study of intrathecal fentanyl and dexmedetomidine added to low dose bupivacaine for spinal anesthesia for lower abdominal surgeries, Indian Journal of Anaesthesia, 58[4], 430. Doi, Vol. 10.4103/0019-5049. PP. 138979, 2014.
- [7] S. Mallick, S. Sawika, S. Chakraborty, S. Ghosh, & Choudhuri, R, A Comparative Study Of Infusion Dexmedetomidine And Infusion Magnesium Sulphate On Attenuation Of Blood Pressure Surge In Laparoscopic Surgery Under General Anaesthesia, Journal of Evolution of Medical and Dental Sciences, Vol. 8[21], 1695–1699, Doi 10, PP. 14260./jemds /2019/373, 2019.
- [8] R. Kabilan, B. Rani, J, Comparison of Intravenous Clonidine and Magnesium Sulfate on Hemodynamic Response during Laparoscopic Surgeries. Indian Journal of Anesthesia and Analgesia, 4[4 [Part-2], 1163–1169. doi, Vol. 10.21088/PP.2349.8471.4417.40, 2017.