Original Research Paper

Volume - 12 | Issue - 08 | August - 2022 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Anaesthesiology

COMPARISON BETWEEN INTRATHECAL DEXMEDETOMIDINE AND CLONIDINE AS AN ADJUVANT TO BUPIVACAINE IN PIH PATIENTS FOR LSCS

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ABSTRACT **Introduction:** Central neuraxial blockade is the preferred technique for LSCS1. Alpha-2 adrenergic agonists Clonidine and Dexmedetomidine have been used along with Intrathecal Bupivacaine in PIH which may help in maintaining Blood pressure. **Aims and objective:** The primary aim of the study was to compare the haemodynamic stability, onset and duration of sensory and motor blockade, side effects on mother and baby between intrathecal dexmedetomidine and clonidine as an adjuvant to intrathecal bupivacaine in PIH patients posted for LSCS. **Methodology:** Sixty patients posted for elective or emergency LSCS were divided in two groups. Group C patients received 30µg of Inj. Clonidine + 2ml of Inj. Bupivacaine 0.5%and Group D, patients received 5µg Inj. Dexmedetomidine + 2 ml of Inj. Bupivacaine 0.5% . (Total volume 2.2ml). Immediately after intrathecal injection of drugs patients were given supine position with wedge under right hip **Observation and Result:** Both groups were comparable with respect to age. Variations in PR during the procedure was comparable in both groups. During entire procedure there was no statistically significant difference in mean MAP between both groups. Time to onset of sensory block was earlier in group D . There was no significant difference in patients level of sensory block between both groups. Sensory action was more prolonged in Group D than in Group C.. Motor block was achieved faster in Group D than in Group C. Duration of motor block was more prolonged in Group D than Group C. **Conclusion:** We conclude that comparable hemodynamic stability was maintained by both intrathecal Dexmedetomidine or Clonidine in pregnancy induced hypertension patients without adverse effects on both mother and baby. Inj. Dexmedetomidine leads to early onset and prolonged sensory and motor block with prolonged postoperative analgesia.

KEYWORDS : Dexmeditomidine, Clonidine, PIH, LSCS

INTRODUCTION:

Central neuraxial blockade is the preferred technique for LSCS[1] as it is simple, safe, economic, easy to perform, with rapid onset and offset of action with good muscle relaxation. It reduces metabolic response to surgery , decreases blood loss, avoid risk of intubation and aspiration, provide early ambulation and starting of breast feeding with least neonatal side effects.[2] The sympathetic blockade improves intervillous blood flow in preeclamptic parturient by decreasing uteroplacental resistance which leads to improved uteroplacental blood flow and neonatal outcome. General anaesthesia for LSCS may lead to an exaggerated cardiovascular response to intubation , cerebral haemorrhage and oedema, pulmonary oedema thereby increasing morbidity and mortality in both mother and baby.[3,4]

Bupivacaine is commonly used local anaesthetic drug used for spinal anaesthesia. Adjuvants are added to local anaesthetics to improve the quality of anaesthesia and prolongation of postoperative analgesia. It reduces the dose of local anaesthetics and the incidence of toxicity.[2] Various adjuvants like Opioids, Ketamine, Midazolam, Neostigmine, Alpha-2 adrenergic agonists such as Clonidine and Dexmedetomidine have been used along with Bupivacaine with varied effects.[1] Dexmedetomidine and Clonidine are safe in pregnant patients.[11,17,21] Dexmedetomidine is more selective for α2 receptor than clonidine and causes dose dependent sedation, anxiolysis and analgesia and blunts the sympathetic response.[5,6]

Very few studies have been done in PIH patients. In this study we compared hemodynamic effects of intrathecal Clonidine and Dexmedetomidine in PIH patients. In this study we compared Dexmedetomidine 5 mcg and Clonidine 30 mcg as adjuvant to bupivacaine for spinal anaesthesia.

AIMS AND OBJECTIVES:

The primary aim of the study was to compare the haemodynamic stability, onset and duration of sensory and motor blockade, side effects on mother and baby between intrathecal dexmedetomidine and clonidine as an adjuvant to intrathecal bupivacaine in PIH patients posted for LSCS.

MATERIAL AND METHOD:

After approval from the Institutional Ethical committee, written informed valid consent, 60 pregnant females with PIH posted for elective or emergency LSCS were included in this study. Patients undergoing LSCS either elective or emergency, diagnosed with pregnancy induced hypertension SBP ≤ 180, DBP ≤100 , ASA GRADE I and II, Age between 18 – 36 and BMI <35 kg/ m2 were included in this study. Patient with ASA Grade III, IV, heart disease, eclampsia, bleeding diathesis, local infections on back, Severe hypovolaemia, neurological disorder and allergy to drugs were excluded from study. Patients requiring general anaesthesia during procedure or refused to participate in study also excluded. A thorough history, clinical examination and investigations of each patient was done preoperatively.

Patients were divided in 2 groups with 30 each by odd and even number randomization technique. Odd number patient was given Inj. Dexmedetomidine and Even number patient was given Inj. Clonidine. Patients posted for elective LSCS were kept NBM for 6 hours prior to the procedure. In emergency LSCS, patients were given anti-aspiration prophylaxis using Inj. Ondansetron 0.08 mg/kg IV, Inj. Ranitidine1mg/kg IV, and Inj. Metoclopramide 0.2 mg/kg IV. On arrival in the operating room patients were preloaded with ringer lactate solution at 10 ml/kg. All patients were monitored with automated non-invasive blood pressure, pulse-oximeter and continuous ECG.

Under all aseptic precautions 25G Quincke's spinal needle was introduced at L3 - L4 interspace in sitting position., Group C patients received 30µg of Inj. Clonidine + 2ml of Inj. Bupivacaine 0.5%. (Total volume 2.2ml). Group D, patients received 5µg Inj. Dexmedetomidine (normal saline as diluent) + 2 ml of Inj. Bupivacaine 0.5% . (Total volume 2.2ml). Immediately after intrathecal injection of drugs patients were given supine position with wedge under right hip and oxygen was administered at 4 L/min using face mask.

All patients were monitored with continuous ECG, SPO_2 and non-invasive blood pressure. Hypotension is defined as decrease in systolic pressure by more than 30% from baseline or less than 90mm of Hg and was treated with inj. Mephentermine 6mg IV and intravenous fluids as required. Bradycardia is defined as heart rate less than 50/min and was treated with IV atropine 0.6 mg.

Sensory level was assessed by loss of pinprick sensation to 23 G

hypodermic needle for onset and dermatomal level tested every 2 minutes until the highest level is stabilized for four consecutive tests. Onset of sensory blockade was considered when patient developed T6 level. Level was then tested every 15 minutes until the point of two segment regression of the block. Quality of analgesia was assessed and graded as follows:

Grade I. Required general anaesthesia for completion of surgery
Grade II. Pain that required addition of the analgesic drug.
Grade III. Mild discomfort but did not require systemic analgesic.
Grade IV. No discomfort at all during procedure

Time of onset of motor block was defined as the time from the injection of drug in subarachnoid space till patient achieved modified Bromage III. Cardiovascular effects were monitored by pulse rate and MAP every 5 min till first 30 min, every 10 min till 1 hour and every 15 min till end of surgery. Sedation was assessed by Ramsay score.

Incidence of side effects (nausea, vomiting, shivering, itching, pruritus, sedation, respiratory depression, bradycardia, dryness of mouth and hypotension) was recorded. Effect on pulse rate and MAP, Onset of sensory and motor block, Highest level of sensory block, Time of regression of two segment, Sedation and Apgar score of babies at 1 and 5 minutes after delivery was recorded .

Data analysis was done by appropriate statistical method with statistical software SPSS Ver. 20 (Statistical Package for the social Sciences).Quantitative data was presented with the help of mean, standard deviation by Unpaired T test as per the result of normality test. Qualitative data was presented with frequency and percentage tables using Chi-square test. P value less than 0.05 was considered as significant.

OBSERVATIONS AND RESULT:

The mean age in Group C was 26.93±4.21 years and in Group D was 25.68±4.01 years. There was no statistically significant difference in patients age between the Group C and Group D (P>0.05). Both groups were comparable with respect to age.

Baseline pulse rate was comparable in both the groups. In group C, the baseline PR was 100.20 ± 11.34 bpm and in Group D baseline PR was 98.37± 14.26 bpm. There was decrease in PR during the procedure compared to baseline value in both groups, but this was statistically not significant. In Group C and Group D variations in PR during the procedure were comparable.

Mean basal MAP in group C was 104.17± 9.86 mm Hg and 101.57 ± 11.60 mm Hg in group D. The difference in basal mean MAP between group C and group D was statistically not significant (P=0.354) (NS).During entire course of the procedure it was found that there was no statistically significant difference in mean MAP between group C and group D (p>0.05).

The mean time to onset of sensory block was 79.57 sec in Group C and was 67.97sec in group D. Time to onset of sensory block was earlier in group D (P<0.0001) . The difference was statistically significant.

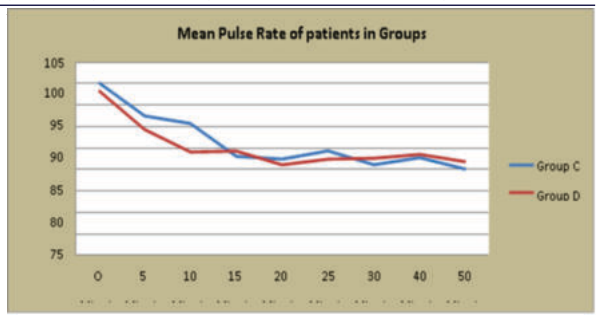
The mean highest level of sensory block in Group C was 5.73 and in Group D was 5.87. There was no significant difference in patients level of sensory block between the Group C and Group D (P>0.05).

Time of 2 segment regression in Group C was 147.6 min and in group D was179.37 min and the difference was statistically highly significant (p<0.0001). Sensory action was more prolonged in Group D patients than Group C patients.

The difference in mean time of onset of motor block of patients compared between Group C and Group D was statistically highly significant (P<0.0001) Motor block was achieved faster with Group D (61.23 ± 10.25) than in Group C (73.03± 11.20).

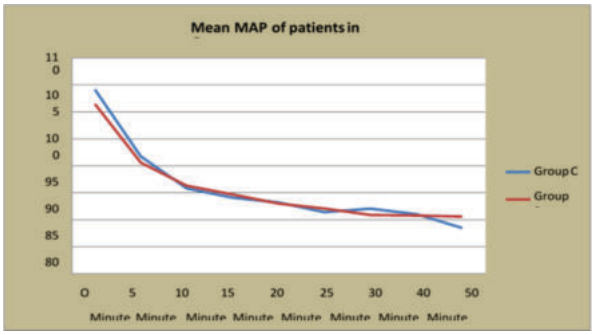
Total duration of motor block in Group C was 274.67 ± 8.99min and in group D was 303.7 ± 11.88 min and the difference was statistically significant (p<0.05).

Duration of motor block was more prolonged in Group D patients than Group C patients Total duration of motor block in Group C was 274.67 ± 8.99min and in group D was 303.7 ± 11.88min and the difference was statistically significant (p<0.05). Duration of motor



Graph 1 Comparison of Mean Pulse Rate during operative procedure

Baseline pulse rate was comparable in both the groups. There was decrease in Pulse Rate during the procedure compared to baseline value in both groups, but this was statistically not significant.



Graph 2 : Comparison of Mean MAP (Mean arterial pressure)

The difference in basal mean MAP between group C and group D was statistically not significant (P=0.354) .During entire procedure it was found that there was no statistically significant difference in mean MAP between group C and group D (p>0.05).

Table 1. Comparison of Mean Time of onset sensory block

	Group C Mean ± SD	Group D Mean ± SD	t-value	P-value
Time to sensory block (sec)	79.57± 10.40	67.97 ± 9.95	4.41	P<0.0001 S

The mean time to onset of sensory block was 79.57 sec in Group C and was 67.97sec in group D. Time to onset of sensory block was earlier in group D (P<0.0001) . The difference was statistically significant.

Table 2 Comparison of Mean Highest level of sensory block

	Group C Mean ± SD	Group D Mean ± SD	t-value	P-value
Highest level of sensory block (thoracic)	T 5.73± 0.69	T 5.87 ± 0.73	0.726	P=0.471 NS

The mean highest level of sensory block in Group C was thoracic 5.73 and in Group D was thoracic 5.87. There was no significant difference in patients level of sensory block between the Group C and Group D (P>0.05). Both groups were comparable with respect to highest level of sensory block.

Table 3 Comparison of Mean Time to 2 segment sensory regression

	Group C (sec) (Mean ± SD)	Group D (sec) (Mean ± SD)	t-value	P-value
Time to 2 segments sensory regression	147.60± 7.06	179.37 ± 9.93	10.22	P<0.0001 S

Time to 2 segment regression in Group C was 147.6 min and in group D was179.37 min and the difference was statistically highly significant (p<0.0001). Sensory action was more prolonged in Group D patients than Group C patients and the difference was highly significant.

Table 4 Comparison of mean Time of onset of motor block of patients

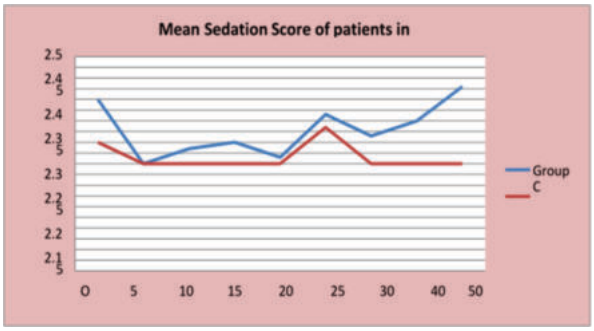
	Group C(sec)	Group D (sec)	t-value	P-value
Time to motor block (Mean ± SD)	73.03± 11.20	61.23 ± 10.25	4.25	P<0.0001 S

Table shows that the difference in mean time of onset of motor block of patients compared between Group C and Group D was statistically highly significant (P<0.0001) Motor block was achieved faster with Group D than in Group C.

Table 5 Comparison of Mean Duration of motor block in Groups:

	Group C (min)	Group D (min)	t value	P-value
Time of motor block (Mean ± SD)	274.67 ± 8.99	303.7 ± 11.88	10.66	P=0.0421 S

Table shows total duration of motor block in Group C and Group D patients. Total duration of motor block in Group C was 274.67 ± 8.99min and in group D was 303.7 ± 11.88 min and the difference was statistically significant (p<0.05). Duration of motor block was more prolonged in Group D patients than Group C patients



Graph 3 Mean Sedation Score of patients in Groups

The difference in the mean sedation scores between group C and Group D was statistically not significant throughout the course of the surgery (P>0.05)

DISCUSSION:

Spinal anaesthesia is now widely used for both elective as well as emergency caesarean section[7]. In PIH patients the incidence of spinal induced hypotension and the vasopressor requirement were found to be two times lower when compared with normal parturient undergoing caesarean[8]. With use of adjuvant stable haemodynamic and better postoperative analgesia can be achieved. α2 adrenergic receptor agonists Clonidine and Dexmedetomidine as additives with intrathecal local anaesthetics provide better haemodynamic stability and prolongation of analgesia in normal patient. In this study we compare efficacy of Dexmeditomidine and Clonidine as an additive in patients of pregnancy with PIH.

In our study, we found that there was no statistically significant difference in basal pulse rate and pulse rate at all intervals between group D and group C. G.E.Kanazi et al in their study reported comparable mean values of PR between saline, group D (3µg Dexmedetomidine) and group C (30µg Clonidine) throughout the intra and post-operative periods[9]. Gunjan Jain et al did a study comparing 10µg Dexmedetomidine and 15µg Clonidine in patients for abdominal hysterectomy and reported that mean PRs were comparable at all time intervals[10]. Our findings are comparable with these studies.

The decrease in preload and blockade of sympathetic cardio accelerator (T1 to T4) fibres is believed to be the most important cause of decrease in heart rate after spinal anaesthesia. Bupivacaine reduces the cardiac contractility by blocking the calcium transport[2] is another reason of bradycardia. The dose of bupivacaine used in both groups was equal and the doses of clonidine and dexmedetomidine were lowest, this may be the reason for comparable pulse rate found in our study. In PIH patients there is vasospasm and sympathetic over activity,[8] Dexmeditomidine and Clonidine may have protective effect in these patients. Alpha-2 agonists stimulate alpha-2 receptor in brain and spinal cord and inhibit the neuronal firing, which leads to hypotension and bradycardia[10] and highly selective α2 agonism of Dexmedetomidine produces better hemodynamic stability and preserves baroreceptor reflex and heart rate response to pressors.[11]

Hypotension after α2-agonist is dose dependent , hypotension was not observed as we used minimal dose. Even though the patients in our study were on antihypertensive drugs like Tab Nifedipine, Tab or Inj. Labetalol or Inj. Magnesium sulphate, we observed that they had good cardiovascular stability with α2-agonist drugs. The difference in basal and intraoperative mean MAP between group C and group D was statistically not significant. Similar result was reported by Gunjan Jain et al [10]. Preloading with 10ml/kg Ringer's lactate could be the reason why hypotension was not observed.

Kujur S etal [12] found that blood pressure was stable in their study. There was no significant difference in findings in normal saline, dexmedetomidine and clonidine groups. Similar study results were obtained by G.E.Kanazi et al[9], Ganesh M, Krishnamurthy D[13] and Vidhi Mahendru et al.[14] Sezen et al[15] conducted a study in 140 female normotensive or hypertensive patients undergoing myomectomies or hysterectomies. Dexmedetomidine was administered at a concentration of 0.5 µg/kg and midazolam was administered at a concentration of 0.025 µg/kg via IV infusion before the induction of anaesthesia. They found that in hypertensive patients dexmedetomidine premedication provided better hemodynamic stability compared with midazolam and it decreased the antihypertensive requirements.

The addition of dexmedetomidine or clonidine to bupivacaine does not cause a significant decrease in the blood pressure intra-operatively or postoperatively. Intrathecal local anaesthetics block the sympathetic outflow and reduce the blood pressure. The sympathetic block is usually near-maximal with the doses used for spinal anaesthesia. The addition of a low dose of α2-agonist to a high dose of local anaesthetics does not further affect the near-maximal sympathetic block. Clonidine in the dose range 37.5-150µg did not cause a significant decrease in blood pressure. When added to 18 mg of bupivacaine compared with bupivacaine alone . In contrast, more than 150µg of clonidine added to a low dose of bupivacaine (5 mg) yielded a greater decrease in blood pressure than bupivacaine alone.[9]

Intrathecal α2-agonists are found to have antinociceptive action for both somatic and visceral pain. They decrease the release of nociceptive substances from substantia gelatinosa by activating the descending inhibitory modulo-spinal pathways.[16] It may be an additive or synergistic effect secondary to the different mechanisms of action of the local anaesthetics and intrathecal α2 adrenoreceptor agonists. Local anaesthetics act by blocking sodium channels. α2 adrenoreceptor agonists act by binding to the presynaptic C-fibres and postsynaptic dorsal horn neurons. They produce analgesia by depressing release of C-fibre transmitters and by hyperpolarization of post synaptic dorsal horn neurons. The complementary action of local anaesthetics and α 2 adrenoreceptor agonists accounts for their profound analgesic properties. The prolongation of the motor block of spinal anaesthetics may be the result of binding of α2adrenoreceptor agonists to the motor neurons in the dorsal horn [2,17,9,14,10),18,11]

We observed that onset and offset of sensory and motor block was significantly earlier in group D than group C. Ganesh M, Krishnamurthy D[16], Rajan R, Gosavi SN et al[19]and Gunjan Jain et al[10] also reported similar observations regarding onset of sensory block. Vidhi Mahendru et al[14] in their study found no significant difference in time to sensory onset between dexmedetomidine and clonidine groups. This may be because their study population was non pregnant patients posted for lower limb surgeries and they used higher dose of bupivacaine.

The rapid onset of sensory and motor block seen in our study may be because of physiological changes of pregnancy such as loss of lumbar lordosis, decreased protein content in CSF and increased sensitivity to local anaesthetic agents due to hormonal changes.[20]

In our study, the mean highest cephalad spread of the sensory block was found to be similar between the Clonidine and Dexmedetomidine groups similar result was reported by Rajan R et al[33(19)], Shweta Kujur et al[12], by Sushruth MR, Rao DG[11],I Bajwa et al.[21]

The sedative effect of alpha-2 agonists is postulated to be hyperpolarisation of excitatory neurons localized in the locus ceruleus (a bilateral nucleus that contains many adrenergic receptors) in the

brainstem.[2,10] In our study the mean sedation scores were found to be comparable during various time intervals between the two groups. Similar findings were reported by Gunjan Jain et al[19], G.E.Kanazi et al1[9], Srinivasan et al[22] and Vidhi Mahendru et al[14] in their studies . Small dosages of intrathecal adjuvants may also be responsible for minimal, or no sedation observed in any of the groups in our study. As intrathecally administered α2 adrenoreceptor agonists have dose-dependent sedative effect. [2,14,18,11] Difference in mean Apgar scores between both the groups was statistically not significant. Similar observations were reported by Bajwa et al[21], Dr Jyoti Kulkarni et a[23], Sushruth MR, Rao DG[11].

After LSCS if mother is awake with good postoperative analgesia, able to take care of new-born which improves mother baby relationship, decreases pre lacteal feeds[2]. All this can be achieved with Inj. Dexmeditomidine or Inj. Clonidine as an adjuvant to intrathecal Inj. Bupivacaine even in cases of PIH posted for LSCS.

SUMMARY AND CONCLUSION:

In this study we observed that intrathecal Inj. Dexmeditomidine or Inj. Clonidine as an adjuvant to Inj Bupivacaine provide good intra-operative cardiac stability during LSCS. Inj. Dexmedetomidine leads to early onset and Prolonged sensory and motor block compared with Inj. Clonidine. Sedation score was comparable between both groups. There were no significant side effects on mother and neonate.

We conclude that comparable hemodynamic stability was maintained by both Dexmedetomidine and Clonidine in pregnancy induced hypertension patients even though they were on antihypertensive drugs without adverse effects on both mother and baby. Inj. Dexmedetomidine leads to early onset and prolonged sensory and motor block with prolonged postoperative analgesia.

REFERENCES

1. Sean Brian Yeoh et al; Anaesthesia for lower-segment caesarean section: Changing perspectives; Indian Journal of Anaesthesia; Year: 2010 | Volume:54 | Issue:5 | Page:409-414
2. Dr. Jyoti Kulkarni, Dr Veena Lodha, Dr Tushar Patil and Dr Ullhas Misal : Comparison of Levobupivacaine and Clonidine with Bupivacaine and Clonidine in Spinal Anaesthesia for Lower Segment Caesarean Section; IOSR Journal of Dental and Medical Sciences (IOSR-JDMS); Volume 15, Issue 8 Ver. I (August. 2016), PP 92-97)
3. Lawes EG, Downing JW, Duncan PW, Bland B, Lavies N, Gane GA.; Fentanyldroperidol supplementation of rapid sequence induction in the presence of severe pregnancy-induced and pregnancy-aggravated hypertension; Br J Anaesth. 1987; 59:1381–91. ([PubMed: 3689612]).
4. Loughran PG, Moore J, Dundee JW.; Maternal stress response associated with caesarean delivery under general and epidural anaesthesia. Br J Obstet Gynaecol.. 1986; 93:943–9.([PubMed: 3533135]).
5. Soumya Samal, Shaswat Kumar Pattnaik, Ankita Mohta, Saubhagya Kumar Jena : Intrathecal dexmedetomidine versus morphine as adjuvant to bupivacaine in elective LSCS: a comparative study ; Indian Journal of Clinical Anaesthesia, 2016;3(4): 607-610
6. J.G.Reveset al/ Intravenous anesthestics/MILLER'S ANESTHESIA /7th edition/ Elsevier publisher/ Page no. 751- 757 and 1624
7. Bucklin BA, Hawkins JL, Anderson JR, Ullrich FA. Obstetric Anesthesia Workforce Survey. Twenty year update. Anesthesiology. 2005; 103: p. 645-53.
8. Ankichetty, Saravanan P. Regional anesthesia in patients with pregnancy induced hypertension. J Anaesthesiol Clin Pharmacol. 2013 Oct-Dec; 29(4): 435–444.
9. G. E. Kanazi, M. T. Aouad, S. I. Jabbour-khoury, M. D. Al Jazzar, M. M. Alameddine, R. Al-Yaman, M. Bulbul and A. S. Barak : Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block ; ACTA ANAESTHESIOLOGICA SCANDINAVICA 2006; 50: 222—227
10. Gunjan Jain, Dinesh Chauhan, Grishma Chauhan, R.M. Upadhyaya : Comparison between Dexmedetomidine and Clonidine as an Adjuvant to Spinal Anesthesia in Abdominal Hysterectomy ; International Journal of Science and Research (IJSR) Volume 4 Issue 1, January 2015
11. Sushruth MR, Rao DG. Effect of adding intrathecal dexmedetomidine as an adjuvant to hyperbaric bupivacaine for elective cesarean section. Anaesth Pain and Intensive Care. 2018; 22(3).
12. Shweta Kujur, K. K. Arora et al. A comparative study on effects of intrathecal ropivacaine plus dexmedetomidine versus ropivacaine plus clonidine. International Journal of Research in Medical Sciences. 2015 Jun; 3(6).
13. Laisalmi M, Koivusalo AM, Valta P, Tikkanen I, Lindgren L. Clonidine provides opioid-sparing effect, stable hemodynamics, and renal integrity during laparoscopic cholecystectomy. SurgEndosc. 2001; 15.
14. Vidhi Mahendru, Anurag Tewari, Sunil Katyal, Anju Grewal, M Rupinder Singh, and Roohi Katyal : A comparison of intrathecal dexmedetomidine, clonidine, and fentanyl as adjuvants to hyperbaric bupivacaine for lower limb surgery: A double blind controlled study ; J Anaesthesiology and Clinical Pharmacology. 2013 Oct-Dec; 29(4): 496–502
15. Sezen et al. Does premedication with dexmedetomidine provide perioperative hemodynamic stability in hypertensive patients? BMC Anesthesiology 2014, 14:113
16. Ganesh M, Krishnamurthy D. A comparative study of dexmedetomidine and clonidine as an adjuvant to intrathecal bupivacaine in lower abdominal surgeries. Anesth Essays Res. 2018; 12:539-45.
17. B.S.Sethi, Mary Samuel, Deepak Sreevastava: Efficacy of Analgesic Effects of Low Dose Intrathecal Clonidine as Adjuvant to Bupivacaine ; Indian Journal of Anaesthesia 2007; 51 (5) : 415-419
18. Avtar Singh Yadav. Comparative evaluation of effects of different doses of intrathecal clonidine with bupivacaine on post operative pain relief. International Journal of Biological and Medical Research. 2013; 4: 2703-2706(1).
19. Rajan R, Gosavi SN,et al.A comparative study of equipotent doses of intrathecal clonidine and dexmedetomidine on characteristics of bupivacaine spinal anesthesia. J Datta Meghe Inst Med Sci Univ. 2018; 13:4-8.
20. Martina Nejdlova et al. Anaesthesia for non-obstetric procedures. British Journal of Anaesthesia. 2012; 12(4)
21. Bajwa et al. Prevention of hypotension and prolongation of postoperative analgesia in emergency cesarean sections: A randomized study with intrathecal clonidine. International Journal of Critical Illness and Injury Science. 2012 MayAug; 2(2).
22. Srinivasan R, Selvarajan R, Anandan H. Comparing Efficacy of Plain Bupivacaine, Bupivacaine with Fentanyl, and Bupivacaine with Dexmedetomidine Intrathecally in Lower Abdominal Surgical Procedures: A Double-Blind Randomized Control Study.Int J Sci Stud 2018;6(2):89-94.
23. Anju Grewal; Dexmedetomidine: New avenues; Journal of Anaesthesiology Clinical Pharmacology | July-September 2011 | Vol 27 | Issue 3