Original Research Article

Study of Dexmeditomidine as an adjuvant to bupivacaine in Ilioinguinal, Iliohypogastric nerve block in transverse abdominis plane in lower abdominal surgeries

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Abstract

Background: Ilionguinal Iliohypogastric Nerve Block (IINIHN)in Transverse abdominis plane(TAP) is new regional anesthesia technique that provides analgesia following lower abdominal surgeries. Bupivacaine is commonest local anesthetic used in TAP block,but insufficient duration of post-operative analgesia, prevails when it is used as sole agent. Dexmeditomidine is alpha-2 receptor agonist which has potential to enhance the duration of peripheral nerve block. In this article we evaluate the prolongation of postoperative analgesia in IINIHN block in transverse abdominis plane given using Dexmeditomidine as an adjuvant to Bupivacaine. **Materials and Methods:** Sixty patients of ASA grade I and II undergoing lower abdominal surgeries in Tertiary care hospital were divided into two groups by randomized double blinded way. Control group received TAP block with 0.5%10cc inj Bupivacaine plus 10cc normal saline, where as Study group received TAP Block with inj Dexmeditomidine 0.5mcg/kg plus 0.5% 10cc bupivacaine plus 10cc normal saline.post-operatively pain scores, haemodynamic parameters, time for rescue analgesia was recorded. Statistical analysis was done using ssep22 version. **Results:** Duration of post operative analgesia was prolonged by administration of Dexmeditomidine to Bupivacaine as compared to Bupivacaine alone (492±12.86 min v/s278±2.78).VAS score were significantly lower 8hr postoperatively. **Conclusion:** Dexmeditomidine as an adjuvant to TAP block prolongs the duration of analgesia postoperatively in patients undergoing lower abdominal surgeries.
Key Word: Dexmeditomidine, Post-Operativeanalgesia, TAP Block

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Received Date: 21/02/2019 Revised Date: 19/04/2019 Accepted Date: 12/06/2019
DOI: https://doi.org/10.26611/101511118

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 26 July 2019

INTRODUCTION

Management of acute post-operative pain has received keen attention in recent years with considerable concurrent advancement in the field.[1,2] Despite this advancement, post-operative pain continues to be a challenge and is often inadequately treated, leading to patient anxiety, stress and dissatisfaction.[2,3,4] Inadequately treated pain can lead to detrimental physiological effects like discomfort, prolonged immobilization to thromboembolic phenomenon and pulmonary complications[5] and may also have psychological, economic and social adverse effects.[2,3] It is believed that if sincere efforts are made, it could be possible to significantly improve the treatment of pain in the developed, as well as the developing countries[6,7] These efforts are of utmost importance as effective pain relief is a powerful technique to modify surgical stress responses,[4] thereby leading to an improved outcome..Analgesic

How to site this article: Rujuta Pandav, Vasudha Jadhav, Jyotsna Paranjpe. Study of Dexmeditomidine as an adjuvant to bupivacaine in Ilioinguinal, Iliohypogastric nerve block in transverse abdominis plane in lower abdominal surgeries. *MedPulse International Journal of Anesthesiology.* July 2019; 11(1): 89-93. http://medpulse.in/Anesthsiology/index.php

multimodalities are recommended to relieve the post-operative pain[8] Nausea and vomiting was the main side-effect seen with the use of I.V opioids while motor block was the most common side-effect in patients receiving epidural infusions. Nausea and vomiting is a very unpleasant sensation leading to considerable discomfort. Motor block is unpleasant and also delays rehabilitation[9] Peripheral nerve block techniques like transversus abdominis plane (TAP) blocks were introduced as an effective component of multimodal analgesia after lower abdominal surgeries. These techniques not only reduced pain quite successfully but also eliminated some of the problems associated with the use of systemic opioids or central neuraxial blocks[10,11]. Ilioinguinal and iliohypogastric blocks have been routinely used as anesthetic technique for surgeries at the inguinal region like inguinal hernia and encysted hydrocoele and for lower abdominal surgeries. These blocks also help in the postoperative analgesia for cesarean section and lower abdominal surgeries.[10,12] The nerve block involves the blocking of ilioinguinal and iliohypogastric nerves in the plane between the transverses abdominis and internal oblique. Dexmedetomidine, an a2 adrenoreceptor agonist[17] was first proposed as an adjuvant capable of prolonging duration of sensory and motor block produced by nerve blocks by Memis¸ and colleagues. Systemic dexmedetomidine (DEX) produces sedative, analgesic, sympatholytic, and anesthetic-sparing effects[14] Recently, DEX as a local anesthetic adjuvant has been the subject of increasing interest as the potential to prolong blockade duration[15,16]. The combined use of a local anesthetic agent and DEX, applied in a TAP block, which targets peripheral nociceptive receptors may be an ideal protocol for pain control after abdominal surgery. In this study we evaluate the prolongation in duration of post-operative analgesia in IINIHN Block in transverse abdominis plane given using Dexmeditomidine as an adjuvant to Bupivacaine.

AIMS and OBJECTIVES

In this study we primarily aimed at evaluating the efficacy of inj. Bupivacaine with inj dexmedetomidine for post operative analgesia in Ilioinguinal, Iliohypogastric nerve block in Transversus Abdominis Plane. we also evaluated the duration of post-operative analgesia, assessed the requirement of rescue analgesia and side-effects of study drug.

MATERIALS AND METHODS

Inclusion criteria: Patient admitted in the hospital undergoing various lower abdominal surgeries under spinal anesthesia of both the sexes with age group 18-60yrs were selected for study purpose.

Exclusion criteria: Refusal of patient to be subject of study.

After obtaining approval from Ethical Committee meeting, this study was held at Tertiary care hospital 60 patients admitted to undergo lower Abdominal Surgeries. Patients were received in pre-anesthesia room, baseline parameters were noted and patient was explained regarding the procedure. Informed valid consent of all the patients was taken. Patients were kept nil by mouth from midnight before surgery. Intravenous access was established with 18 Gauge canula. Standard monitors were attached and patients were given spinal anesthesia using standard protocol. After undergoing elective lower abdominal surgery under spinal anesthesia patients were given Ilioinguinal, Iliohypogastric Nerve block in Transversus Abdominis plane by ultra sound guided technique under all aseptic precautions. In Control group Patients 10cc o.5% Bupivacaine plus 10cc normal saline was administered bilaterally, and in Study group inj Dexmedetomidine 0.5 mcg/kg (0.25ml) plus 10 c.c 0.5% Bupivacaine plus 10cc normal saline was given bilaterally. Onset of pain was assessed by Visual Analogue Scale with 0 as No pain and 10 as Worst possible, unbearable excruciating pain. Time taken for first demand of rescue analgesia and VAS score was noted and analgesia was provided in the form of inj Diclofenac 75 mg intra muscular if VAS score is > 3/4. During post-operative period pulse, blood pressure, MAP and side-effects like hypotension, bradycardia, haematoma formation, local infection were noted in both the groups of patients. All the patients were observed in post¯anesthesia recovery room and later in high dependency ward as per institutional protocol.

Statistical Analysis: The data was entered in Microsoft Excel data sheet and analysed using SPSS22 version software. Catagorical data represented in form of frequencies and proportions. chi-square used to analyse qualitative data. Continuous data represented as mean and standard deviation. Paired T-test was test of significance for paired data. p value<0.05% was considered statistically significant.

OBSERVATION AND RESULTS

Table1: Demographic parameters

GROUPS (n=60)	Study Group(n=30) Mean ±SD	Control group(n=30) Mean ±SD	P-Value	Significance
Age(years)	44.43±2.2	43.1±1.59	>0.05	NS
Sex	56.39±2.6	55.48±3.1	>0.05	NS
Weight	63.8±1.37	61.866±2.17	>0.05	NS
ASA Grade(I/II)	28/2	24/2	>0.05	NS

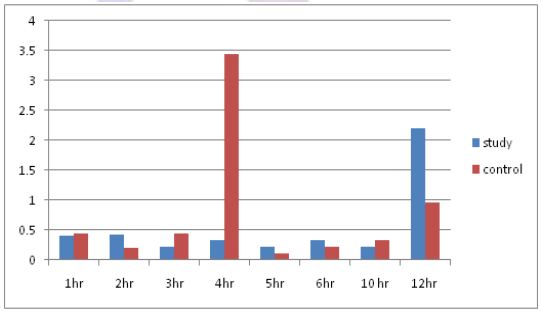
Demographic parameters were comparable in study and control group

Table2: Heart Rate monitoring in study and control groups

Time	Study Group(n=30) Mean ±SD	Control group(n=30) Mean ±SD	P-Value	Significance
1hr	80.12±1.21	81.12±1.52	>0.05	NS
2hr	82.26±1.32	82.24±1.5	>0.05	NS
3hr	83.62±1.22	83.1±1.36	>0.05	NS
4hr	80.22±1.67	100.83 ± 1.46	<0.05	Significant
5hr	79.98±1.77	82.23±1.14	>0.05	NS
6hr	81.24±1.62	81.82±1.3	>0.05	NS
10hr	82.03±1.85	82.25±1.25	>0.05	NS
12hr	105.31±1.12	82.6±1.35	<0.05	Significant

Table 3: MAP(mean arterial pressure)monitoring in study and control group

Time	Study Group(n=30) Mean ±SD	Control group(n=30) Mean ±SD	P-Value	Significance
1hr	77.52±2.21	74.26±2.26	>0.05	NS
2hr	77.23±2.51	73.41±1.32	>0.05	NS
3hr	77.5±1.81	74.73±2.6	>0.05	NS
4hr	78.24±1.61	74.05±1.71	>0.05	NS
5hr	78.34±1.55	73.96±1.69	>0.05	NS
6hr	77.89±1.43	74.16±1.72	>0.05	NS
10hr	78.1±1.6	75.42±2.31	>0.05	NS
12hr	77.82±1.85	77.36±1.35	>0.05	NS



Graph1: Comparison of visual analogue score in study and control group

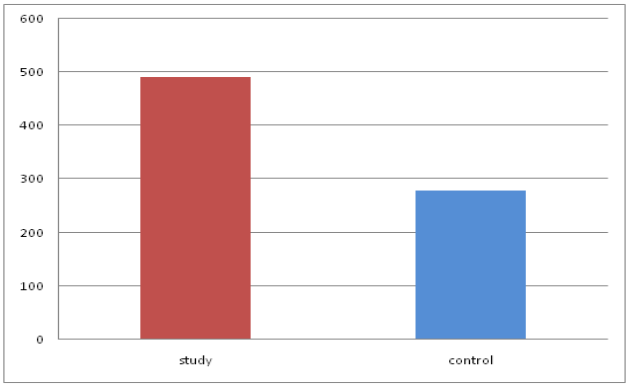
Table 6: Comparison of VAS score between study group and control group

Time	Study Group(n=30) Mean +SD	Control group(n=30) Mean +SD	P-Value	Significance
1hr	0.41±0.79	0.45±0.23	>0.05	NS
2hr	0.43±0.34	0.21±0.33	>0.05	NS
3hr	0.22±0.12	0.45±0.21	>0.05	NS
4hr	0.34±1.22	3.44±0.50	<0.05	Significant
5hr	0.23±0.19	0.12±0.34	>0.05	NS
6hr	0.34±0.45	0.23±0.11	>0.05	NS
10hr	0.22±0.11	0.34±0.12	>0.05	NS
12hr	2.21±1.01	0.97±1.016	<0.05	Significant

Table 7: Duration of postoperative analgesia

Parameters	Study Group(n=30) Mean +SD	Control group(n=30) Mean +SD	P-Value	Significance
Duration of post-operative analgesia	492±12.86min	278±2.78min	<0.05	significant

Duration of postoperative analgesia is prolonged in study group.



Graph 2: Comparison in duration of post-operative analgesia in study and control group.

DISCUSSION

The important end point of this study was to evaluate the duration of prolongation of post operative analgesia after using Dexmeditomidine as an adjuvant to Bupivacaine in Ilioinguinal Iliohypogastric Nerve Block in lower abdominal surgeries, In our study there was significant prolongation in duration of post- operative analgesia in study group, also VAS pain scores were lower and rescue analgesia required was less as compared to control group. Dexmedetomidine is a potent and selective α_2-adrenoreceptor agonist. The antinociceptive properties of intrathecal α_2-adrenoreceptor agonists are manifested by suppressing the release of C-fibre transmitters, hyperpolarisation of post-synaptic dorsal horn neurons and inhibition of release of substance P[19] In addition, the effectiveness of α_2-adrenoreceptor agonist has been shown to correspond well with their binding affinity to spinal α_2-adrenoreceptors[18] According to some animal and human studies, dexmedetomidine prolongs not only the duration of sensory block, but also the degree and duration of the motor block[19,20] The potentiation mechanism of motor block by dexmedetomidine is not well established, but is suggested to be an additive or synergistic effect to the local anaesthetics, or related to the interference with neuromuscular activity, or binding of α_2-agonists to motor neurons in the dorsal horn[21.] Brummett *et al.*, showed that dexmedetomidine enhances duration of bupivacaine anesthesia and analgesia of sciatic nerve block in rats without any evidence of histopathological damage to the nerve[.23,24,25] Kosugi *et al.*, examined the effects of various adrenoceptor agonists including dexmedetomidine, tetracaine, oxymetazoline and clonidine, and also an α2 adrenoceptor antagonist (atipamezole) on compound action potential (CAP) recorded from frog sciatic nerve, and found that CAPs were inhibited by α2 adrenoceptor agents so that they were able to block nerve conduction[.26] Yoshitomi *et al.*, demonstrated that dexmedetomidine as well as clonidine enhanced the local anesthetic action of lignocaine via peripheral α-2A adrenoceptors[.27.] Masuki *et al.* suggested that dexmedetomidine induces vasoconstriction via α2 adrenoceptors in the human forearm[28] possibly also causing vasoconstriction around the site of injection, delaying the absorption of local anesthetic and hence prolonging its effect. Esmaoglu *et al.*, reported prolongation of axillary brachial plexus block when dexmedetomidine was added to levobupivacaine[.29.] Dexmedetomidine is a highly specific and selective α2 adrenoceptor agonist with α2:α1 binding selectivity ratio of 1620:1 as compared to 220:1 for clonidine, thus decreasing the unwanted side effects of α1 receptors,in our study we have added 0.5mcg/kg of dexmeditomidine to 0.25% Bupivacaine which lead to significant prolongation of post-operative analgesia without any side-effects unlike clonidine[.31] Saurabh Singh , H. S. Nanda conducted a comparative study of clonidine and dexmedetomidine as adjuvant to 0.25% bupivacaine in supraclavicular brachial plexus block for duration of action and haemodynamic changes. Their findings was that dexmedetomidine significantly prolonged the duration of action and significant decrease in haemodynamic parameters, but did not require any active intervention for the same[32] Dexmeditomidine has side-effects like hypotension, bradycardia and sedation[33] with higher doses, but in our study ,no such side-effects were observed and patient were haemodynamically stable.

REFERENCES

1. Kehlet H. Effect of postoperative pain treatment on outcome-Current status and future strategies. Langenbecks Arch Surg. 2004; 389: 244–9.
2. White PF, Kehlet H. Improving postoperative pain management: What are the unresolved issues? Anesthesiology. 2010; 112: 220–5.
3. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: Results from a national survey suggest postoperative pain continues to be undermanaged. Anesth Analg. 2003;97:534–40.
4. Kehlet H, Holte K. Effect of postoperative analgesia on surgical outcome. Br J Anaesth. 2001;87:62–7.
5. Ganai S, Lee KF, Merrill A, Lee MH, Bellantonio S, Brennan M, et al. Adverse outcomes of geriatric patients undergoing abdominal surgery who are at high risk for delirium. Arch Surg. 2007; 142: 1072–8.
6. Brennan F, Carr DB, Cousins M. Pain management: A fundamental human right. Anesth Analg. 2007; 105: 205–21.
7. Kehlet H, Wilkinson RC, Fischer HB, Camu F Prospect Working Group. PROSPECT: Evidence-based, procedure-specific postoperative pain management. Best Pract Res Clin Anaesthesiol. 2007;21:149–59.
8. Elia N, Lysakowski C, Tramèr MR. Does multimodal analgesia with acetaminophen, nonsteroidal antiinflammatory drugs, or selective cyclooxygenase-2 inhibitors and patient-controlled analgesia morphine offer advantages over morphine alone? Meta-analyses of randomized trials. Anesthesiology. 2005; 103: 1296–304.
9. Ahmed Aliya,Latif Naveed,Khan Robnya.Post-operative analgesia for major Abdominal surgery and its effectiveness in tertiary care hospital.Journal of anaesthesiology clinical pharmacology2013;29(4):472-77
10. McDonnell JG, O'Donnell B, Curley G, Heffernan A, Power C, et al. The analgesic efficacy of transversus abdominis plane block after abdominal surgery: a prospective randomized controlled trial. Anesth Analg. 2007; 104(1):193–7.
11. Siddiqui MR, Sajid MS, Uncles DR, Cheek L, Baig MK. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. J Clin Anesth. 2010; 23(1):7–14.
12. Dahl JB, Jeppesen IS, Jorgensen H, Wetterslev J, Moiniche S. Intraoperative and postoperative analgesic efficacy and adverse effects of intrathecal opioids in patients undergoing caesarean section with spinal anesthesia: a qualitative and quantitative systematic review of randomized controlled trials. Anesthesiol. 1999; 91: 1919–27.
13. Gofeld M, Christakis M. Sonographically guided ilioinguinal nerve block. J Ultrasound Med. 2006; 25: 1571–5.
14. Gerlach AT, Murphy CV, Dasta JF. Anupdated focused review of dexmedetomidine in adults. Ann Pharmacother. 2009; 43: 2064–2074.
15. Marhofer D, Kettner SC, Marhofer P, et al. Dexmedetomidine as an adjuvant to ropivacaine prolongs peripheral nerve block: a volunteer study. Br J Anaesth. 2013; 110: 438–442
16. El-Boghdadly K, Brull R, Sehmbi H, et al. Perineural dexmedetomidine is more effective than clonidine when added to local anesthetic for supraclavicular brachial plexus block: a systematic review and meta-analysis. Anesth Analg. 2017;124:2008–2020
17. Gabriel JS, Gordin V. Alpha 2 agonists in regional anesthesia and analgesia. Curr Opin Anaesthesiol 2001; 14: 751–3
18. Asano T, Dohi S, Ohta S, Shimonaka H, Iida H. Antinociception by epidural and systemic alpha(2)-adrenoceptor agonists and their binding affinity in rat spinal cord and brain. Anesth Analg 2000; 90: 400-7.
19. Salgado PF, Sabbag AT, Silva PC, Brienze SL, Dalto HP, Módolo NS, *et al.* Synergistic effect between dexmedetomidine and 0.75% ropivacaine in epidural anesthesia. Rev Assoc Med Bras (1992) 2008; 54: 110-5.
20. Calasans-Maia JA, Zapata-Sudo G, Sudo RT. Dexmedetomidine prolongs spinal anaesthesia induced by levobupivacaine 0.5% in guinea-pigs. J Pharm Pharmacol 2005; 57: 1415-20.
21. Kim JE, Kim NY, Lee HS, Kil HK. Effects of intrathecal dexmedetomidine on low-dose bupivacaine spinal anesthesia in elderly patients undergoing transurethral prostatectomy. Biol Pharm Bull 2013; 36: 959-65.
22. Talke PO, Caldwell JE, Richardson CA, Kirkegaard-Nielsen H, Stafford M. The effects of dexmedetomidine on neuromuscular blockade in human volunteers. Anesth Analg 1999; 88: 633-9.
23. Brummett CM, Norat MA, Palmisano JM, Lydic R. Perineural administration of dexmedetomidine in combination with bupivacaine enhances sensory and motor blockade in sciatic nerve block without inducing neurotoxicity in rat. Anesthesiology. 2008; 109: 502–11.
24. Brummett CM, Amodeo FS, Janda AM, Padda AK, Lydic R. Perineural dexmedetomidine provides an increased duration of analgesia to a thermal stimulus when compared with a systemic control in a rat sciatic nerve block. Reg Anesth Pain Med. 2010; 35: 427–31.
25. Brummett CM, Hong EK, Janda AM, Amodeo FS, Lydic R. Perineural dexmedetomidine added to ropivacaine for sciatic nerve block in rats prolongs the duration of analgesia by blocking the hyper polarization-activated cation current. Anesthesiology. 2011; 115: 836–43.
26. Kosugi T, Mizuta K, Fujita T, Nakashima M, Kumamoto E. High concentrations of dexmedetomidine inhibit compound action potentials in frog sciatic nerve without alpha (2) adrenoceptor activation. Br J Pharmacol. 2010; 160: 1662–76.
27. Yoshitomi T, Kohjitani A, Maeda S, Higuchi H, Shimada M, Miyawaki T. Dexmedetomidine enhances the local anesthetic action of lidocaine via an alpha-2A adrenoceptor. Anesth Analg. 2008; 107: 96–101.

Source of Support: None Declared
Conflict of Interest: None Declared