ORIGINAL RESEARCH

Comparision of intrathecal clonidine and intrathecal fentanyl inhyperbaric bupivacaine for spinal anaesthesiaand postoperative analgesia for lower limb surgeries

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ABSTRACT

Introduction: To prolong the effect of spinal anesthesia with lesser adverse reaction various adjuvants has been used. Aim of this study is to compare the role of Fentanyl and clonidine as adjuvant to Intrathecal bupivacaine in patients undergoing lower limb surgeries under spinal anaesthesia.

Material and methods: The study was conducted in the department of Anaesthesiology at Career Institute of medical,Lucknow. A total of 60 patients of ASA 1 and 2 between 20-75 year posted for lower limb surgery under spinal anaesthesia were randomly allocated into two groups (n= 30 each).It was prospective randomized study. In this study patients were divided into two group of thirty each. Group-A received intrathecal hyperbaric bupivacaine 2.5 ml +25µg Fentanyl. Group-B received intrathecal hyperbaric bupivacaine 2.5 ml+20 µg clonidine. Time of onset and duration of sensory and motor block, hemodynamics parameters and side effects recorded. VAS and the supplemental analgesic administered was also documented.

Results: Both the groups were comparable in terms of onset and offset of sensory and motor blockade, where as duration of analgesia was prolonged in Group B as compared to Group A and the time for requirement of first analgesic dose is longer in Group B as compared to Group A.Complications and side effects are similar in both the groups and are not statistically significant. (P>0.05).

Conclusion: We concluded that addition of Clonidine to intrathecal bupivacaine offers longer duration of blockade and post operative analgesia than fentanyl.

Keyword: Fentanyl, Clonidine, Intrathecal, Bupivacaine, Postoperative analgesia .

Introduction

For lower limb surgeries spinal anaesthesia is preferred over general anaesthesia due to its advantages such as decreased intraoperative blood loss reduce incidence of deep vein thrombosis and continued postoperative analgesia. Various adjuvants to local anaesthetics are used like opioids(***Wang et al 1979***), neostigmine ,clonidine and adrenaline to potentiate the effect of spinal anaesthesia. Many opioids have been used in spinal anaesthesia. Fentanyl citrate is a very potent μ - 1 and μ - 2 agonist. It is preferred as adjuvant in spinal anaesthesia due to its rapid onset and short duration of action with lesser incidence of respiratory depression. Due to opioids adverse drug reactions at nausea, vomiting, pruritis, urinary retention and late respiratory depression have directed the pain research towards non-opioid adjuvants. Various studies suggested that intrathecal clonidine prolongssensory and motor block of spinal anaesthesia. It also decreaseslocalanaestheticrequirements,andprovidesprolongedpostoperativeanalgesia.

Otherbeneficialeffectsareantiemesis,reducedpostspinalshivering,anxiolysisandsedation. Unlike opioids, clonidine does not produce pruritusor respiratory depression. In this study we have comparedintrathecal clonidine with intrathecal fentanyl for their efficacy and safety as adjuvant to hyperbaric bupivacaine in spinal anaesthesia and postoperative analgesia in lower limb surgeries.

Material and Methods

After approval from Institutional Ethics Committee and written informed consent thestudywasconductedinthedepartmentofAnaesthesiologyat Career Institute of Medical Sciences, Lucknow.

Inclusion Criteria

A total of 60 patients belonging to ASA Grades 1 and 2between 20 to 75 years age of either sex were included inthestudy,scheduledforvarioussurgicalororthopaedicproced uresoflowerlimb.

Exclusion Criteria

Patients on alpha blockers and contraindication to regional anaesthesia, history of ischemic heart disease, diabetes mellitus, bleeding diathesis, infection at the puncture site and allergy to local anaesthetics.A detailed preanaesthetic checkup was conducted one day prior to surgery. Patient were instructed about the visual analogue scale(VAS) preoperatively as a tool for measuring postoperative pain.

Patients were premedicated with ranitidine 150mg and alprazolam 0.25mg orally on the night before surgery and patient kept for fasting for 6 hours preoperatively. After taking patient in the operating room standard monitors including non-invasive blood pressure, pulse oximetry and electrocardiogram were applied. An 18gauge intravenous line was secured and lactated ringer solution was used as intravenous fluid. On the day of surgery patient were randomly allocated into two groups (n=30 each) according to drug received :-

Group A – Received hyperbaric bupivacaine (2.5 ml) + 25μgfentanyl administered intrathecally

Group B – Received hyperbaric bupivacaine (2.5 ml) +20μgclonidineadministeredintrathecally.

After attaching standard monitors and recording baseline vitals : BP,HR,SpO2 were recorded 5min before giving spinal anaesthesia and the patients was preloaded with 10ml/kg of ringer lactate over 15-20 min. After preloading the patient carefully positioned and under all aseptic precaution spinal anaesthesia was administered at the L4-L5 or L3-L4 level in sitting position using a 25 gauge Quincke Babcock spinal needle after prior local infiltration with 2ml of 0.5% lignocaine the vitals were recorded at 5,10,15,20 and 25minute after spinal anaesthesia and subsequently every 15min on the duration of surgery. After giving spinal anaesthesia sensory and motor block was monitored at 2,5,8,10,15 min, and after that at 15 min interval. Sensory block was tested by Pinprick method. The motor block was assessed according to the modified Bromage scale.

Bromage 0: Patient able to move hip, knee and ankle,

Bromage1:Patients unable to move hip but able to move the knee andankle,

Bromage 2: Patient unable to move hip and knee butable to move the ankle,

Bromage 3: Patient unable to movehip, knee, and ankle.

After complete sensory and motor blockade the patient were placed in the supine position for surgery.

The onset of sensory block was takenfrom the time of intrathecal injection till loss of pin pricksensation at T10. Duration of sensory block was taken astimefrommaximumheightofblocktillregressiontoLevel 1.Theonsetofmotorblockwasdefinedastimefromintrathecal injection to motor blockade Level 2 in Bromagescale. Duration of motor blockade was taken as time fromintrathecal injection till no motor weakness (Bromage 0).Duration of analgesia was defined as time from intrathecalinjectiontilladministrationoffirst rescueanalgesic.The time of onset and duration of sensory block, highest dermatome level of sensory block, time of onset of motor block, time to complete motor block recovery and duration of spinal anaesthesia were recorded. At the end of the procedure, patients were shifted to post anaesthesia care unit (PACU) where monitoring was continued.

In the PACU BP, HR, and SpO_2 were recordedevery 15 min for 1st hour and then half hourly till 4th hour and then every 4 hour till completion of 24 hour. Hypotension was defined as SBP of less than 20% below baseline. Hypotension was treated with i.v. ephedrine 10mg repeated every 5mins if needed. Bradycardia was defined as HR<50 beats/min for which 0.5mg of atropine sulphate was administered intravenously.

Sedation was evaluated using a 4-point sedation scale:-

0 – awake and alert

1 – drowsy, but responding to verbal commands

2 – not responding to verbal commands, but responding to manual stimulation.

3 – difficult to awaken

Pain score using VAS were assessed in the PACU at 0,30min,1,$1^{1/2}$,2,3,4,8,12,18,24 hours any patient reporting VAS more than 5 was given an analgesic injection Diclofenac sodium 75mg IV. The amount of supplemental analgesic administered in the next 24 hour was documented in both the groups.

Table1: Demographic details

Variables	Group A(n=30)	Group B(n=30)
Age (years)	32.16±14.24	30.64±12.24
Weight (kg)	72.24±7.25	65.75±10.99
Height (cm)	162.0±4.3	162.50±5.00
ASA grade 1/11	15/9	10/13
Male/Female	25/2	20/7
Duration of surgery(min)	70.00±25.72	72.60±25.72

Values in the table are mean±SD or absolute numbers (%), SD= standard deviation, ASA= American Society of Anaesthesiology.

Table2: Comparison of blockade(on set and regression of sensory and motorblock) and analgesic duration

Parameters	Mean±SD		P-Value
Group A(n=30)		**Group B (n=30)**	
Timeinmintoonsetofsensoryblockade	0.89±0.19	0.90±0.18	0.82
Timein min to onsetofmotorblockade	1.56±0.45	1.70±0.49	0.44
Timeinminfor peakofsensoryblockade	7.32±0.96	7.54±1.78	0.94

Twosegmentregressiontimein 132±14.56 min forsensoryblockade		135.56±12.65	0.35
Timein minforweaningoffer motorblock	188.50±18.65	182.58±12.07	0.23
Timein minforfirstdoserescue414.87±105.67analgesic		495.20±139.78	0.0004

Table 3: Complications and side effects

SideEffects	Group A(n=30)	Group B(n=30)
Nausea	1	0
Vomiting	0	0
Pruritis	0	0
Hypotension	0	0
Bradycardia	0	1
Respiratorydepression	0	0
Shivering	3	2

Result

A total of 60 patient were studies in the age group of 20-75 years of either sex. There was no statistically significant difference in hemodynamic parameter (BP,HR) observed in both the groups.

Comparison of blockade in terms of onset,duration,wearing of and need of rescue analgesia Table 2. Severe hypotension was not noted in any group and only one incidence of bradycardia requiring treatment with atropine was noted in the group with intrathecal clonidine.

Boththegroupswerecomparableintermsofonsetandoffset of sensory and motor blockade, whereas duration ofanalgesiawasprolongedinGroupBascomparedtoGroup A and the time for requirement of first analgesic dose islongerinGroupBascomparedto GroupA.

Complications and side effects are similar in both the groups andarenotstatistically significant(P>0.05)andthese complications aredepictedinTable3.

Discussion

Our study compare two drugs as adjuvants: Fentanyl and clonidine[2,3]with hyperbaric bupivacaine several studies has been done with many adjuvants to prolong the duration of spinal anaesthesia with lesser side effects. Fentanyl citrate a **μ** -receptor agonist is a very potent drug because of its high lipophilicity. It is preferred as an adjuvant in spinal anaesthesia because of its rapid onset and short duration of action with lesser incidence of respiratory depression. Due to pruritis,nausea,vomiting,urinary retention and late respiratory depression of other opioids have directed the research towards non-opioid adjuvant.

It was shown in some studies that intrathecal clonidine prolongs sensory and motor block of spinal anaesthesia. Clonidine is a selective partial agonist for Alpha-2 adrenoreceptors. It is known to potentiate both sensory and motor block of local anaesthetics. The possible mechanisms involved in potentiating spinal block include : Suppression of activity of wide dynamic range neurons and release of substance P, norepinephrine and acetylcholine in spinal cord dorsal horn and direct inhibition of impulse conduction in A-Delta and specially C fibers, possibly by increasing potassium conductance. Clonidine, thus complements the action of local anaesthetics and opioids by modulating the transmission of painful stimuli thereby preventing the state of central sensitization.

In our study wecomparedefficacyofintrathecalfentanylwiththatofintrathecalclonidineasadjunctswithhyperbaricbupivacaine for subarachnoid block with respect to onset,offset and duration of sensory and motor block and the timerequiredforfirstdoseofrescueanalgesia.

Likeother studies,wefoundthatbothfentanylandclonidineareeffectiveas adjunctstohyperbaricbupivacainein prolonginganalgesiaduration.Durationofanalgesiawas significantly higher in clonidine group (495.20±139.78 min)than in fentanyl group (414.87±105.67), (P<0.05) (***BenhamouD et al***).Only one had significant bradycardia needed IV atropine treatment. Similarly very few incidences of hypotension and bradycardia was seen with both the groups. Both thegroups aresimilar regarding onset,peak,anddurationofsensoryandmotorblock,butthedurationofanalgesiaissignificantlyhigherinclonidinegroup thanin fentanylgroup (P< 0.05).

Conclusion

From our study we concluded that Clonidine 20 μg intrathecally with hyperbaricbupivacaine offers longer duration of blockade than fentanyl 25 μg. Both the drugs offer similar surgical conditions andprolongspostoperative analgesia but clonidine group offers more prolonged effect of spinal anaesthesia and analgesia in comparison to fentanyl.

References

1. Benhamou D, Thorin D, Brichant JF. Intrathecal clonidine and fentanyl with hyperbaric bupivacaine improves analgesia during cesarean section. AnesthAnalg.1998; 87 (3): 609—613.
2. Nazareth M, Ghoshal P, Namshikar V, Gaude Y. Addition of intrathecal fentanyl to bupivacaine clonidine mixture effect on quality of subarachnoid block and postoperative analgesia. Anesth Essays Res 2013;7:76-82.
3. Ghoshal P, Namshikar V, Gaude Y, Nazareth M. Addition of intrathecal fentanyl to bupivacaine clonidine mixture effect on quality of subarachnoid block and postoperative analgesia. Anesthesia.2013; 7 76.
4. Engelman E, Marsala C. Efficacy of adding clonidine to intrathecal morphine in acute postoperative pain: Meta-analysis. Br J Anaesth 2013;110:21-7.
5. Sun S, wang J, Bao N, Chen Y, wang J. Comparison of dexmedetomidine and fentanyl as local anesthetic adjuvants in spinal anesthesia: a systematic review and   meta-analysis of randomized controlled trials. DrugDesDevelTher.2017; Il: 3413— 3424.
6. Marri SR. Adjuvant agents in regional anaesthesia. Anaesthesia & Intensive Care Medicine.2012; 13 (1 1): 559-562.
7. GraceD, BuntingH, MilliganKR. Postoperative analgesia after co – administration of clonidine and morphine by the intrathecal route in patients

undergoing hip replacement. AnesthAnalg. 1995; 80 86—91.
8. Bonnet F, Buisson VB, Francois Y. Effects of oral and subarachnoid clonidine on spinal anesthesia with bupivacaine. Reg Anesth.1990; 15 (4): 211—214.
9. Dobrydnjov I, Axelsson K, Gupta A, Lundin A, Holmström B, Granath B. Improved analgesia with clonidine when added to local anesthetic during combined spinal-epidural anesthesia for hip arthroplasty: A double-blind, randomized and placebo-controlled study. Acta Anaesthesiol Scand 2005;49:538-45.
10. Singh R, Gupta D, Jain A. The effect of addition of intrathecal clonidine to hyperbaric bupivacaine on postoperative pain after lower segment caesarean section: A randomized control trial. Saudi J Anaesth 2013;7:283-90.
11. Yoganarasimha N, Shridhar K, Raghavendra TR, Amitha S, Radha MK. A comparative study between intrathecal clonidine and neostigmine with intrathecal bupivacaine for lower abdominal surgeries. Indian J Anaesth.2014; 58 (1): 43.
12. Grace D, Milligan KR, Morrow BJ, Fee JP. Co-administration of pethidine and clonidine: A spinal anaesthetic technique for total hip replacement. Br J Anaesth 1994;73:628-33.
13. Sites BD, Rohan C, Biggs R, Beach ML, Wiley C. Intrathecal Clonidine Added to a Bupivacaine Morphine Spinal Improves Postoperative Analgesia for Total Knee Arthroplasty. Anesthe – siology.2002; 96 (Sup 2): 918.
14. do CarmoC Juliäo M, Lauretti GR. Low – dose intrathe – cal clonidine combined with sufentanil as analgesic drugs in abdominal gynecological surgery. J CliniAnesth.2000•, 12 (5): 357-362.
15. Gabriel JS, Gordin V. Alpha 2 agonists in regional anesthesia and analgesia. Curr Opin Anaesthesiol 2001;14:751-3.
16. Gecaj-Gashi A, Terziqi H, Pervorfi T, Kryeziu A. Intrathecal clonidine added to small-dose bupivacaine prolongs postoperative analgesia in patients undergoing transurethral surgery. Can Urol Assoc J 2012;6:25-9.