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A COMPARATIVE EVALUATION OF INTRATHECAL FENTANYL AND DEXMEDETOMIDINE AS AN ADJUVANT TO BUPIVACAINE FOR LOWER ABDOMINAL SURGERIES.

Anaesthesiology

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ABSTRACT

Introduction: spinal anaesthesia is most commonly used technique for abdominal surgeries as it is very economical, easy to administer and has rapid onset of action.Adjuvants like Morphine, Fentanyl, Clonidine, Dexmedetomidine, Neostigmine, Tramadol etc. are used for gain better quality of anaesthesia.

Objectives: The study was aimed to compared intrathecal Dexmedetomidine and Fentanyl as adjuvant to hyperbaric Bupivacaine in term of; (a) evaluation of sensory and motor blocks in regard to, onset duration, and quality of spinal anaesthesia (b) duration of post-operative analgesia and requirement of rescue analgesia within 24 hr after surgery. (c) Perioperative haemodynamic stability (d) side effects and complication.

Methods: All selected patients were randomly divided into two groups as follow: group F: patients were given hyperbaric Bupivacaine 15 mg (3.0 ml) with 25 mcg (0.5 ml) Fentanyl. Group D: patients were given hyperbaric Bupivacaine15 mg (3.0 ml) with 5 mcg (0.5 ml) Dexmedetomidine to make final volume 3.5 ml. we used 50mcg/ml and 50 mcg/0.5 ml concentration of Fentanyl and Dexmedetomidine respectively. Group F and Group D was then compared.

Results: Patients in Dexmedetomidine group had a significantly longer duration of motor and sensory block than patients in Fentanyl group. The mean time regression of motor block to reach Bromage 0 was 227.83+12.24 min in Dexmedetomidine group and 179.96+9.29min in Fentanyl group ($p<0.05$). Duration of analgesia was 279.33+ 10.14 min in Dexmedetomidine group and 172.90+6.78 min in Fentanyl group ($p<0.005$).

Side effects: No significant difference was observed among different groups for any of the side effects.Hypotension, bradycardia is more in Dexmedetomidine group than Fentanyl group.

Conclusion: The duration of analgesia and motor block was more prolonged with Dexmedetomidinegroup than Fentanyl group along with significant decrease in heart rate.

KEYWORDS

Analgesia, intrathecal Bupivacaine, Dexmedetomidine, Fentanyl, lower abdominal surgery.

Introduction:

Spinal anaesthesia is also called spinal block, subarachnoid block, intradural and or intrathecal block. Spinal anaesthesia was first introduced into clinical practice by **August Bier in 1898**[1]. Spinal anaesthesia is most commonly used technique for abdominal surgeries as it is very economical, easy to administer and has rapid onset of action. Hyperbaric Bupivacaine is commonly used as local anaesthetic for spinal anaesthesia in lower abdominal surgeries.Intrathecal local anaesthesia alone is associated with relatively short duration of action and thus early analgesic intervention is needed in post-operative period. Various drugs are used along with local anaesthetic to facilitate the prolongation of duration of spinal block both for long procedures and for postoperative pain relief.

Fentanyl, a lipophilic opioid, can produce more rapid onset and better quality surgical block [2]. However the addition of opioids to local anaesthetic solution has disadvantage such as pruritus and respiratory depression.[3]

Dexmedetomidine is a new highly selective Alfa 2 agonist and is more suitable adjuvant to spinal anaesthesia as compared to Clonidine as it has more sedative and analgesic effects due to its more selective Alpha2A receptors agonist activity [4]. The stable hemodynamic and the decreased oxygen demand due to enhanced sympatho adrenal stability make this agent very useful pharmacologic agent for preoperative patients care. Bolus dose of Alpha2 agonists is associated with side effects like hypotension and bradycardia.

The objective of this study was to compared, the safety and analgesic efficacy of intrathecal administered Dexmedetomidine with Fentanyl in patients undergoing lower abdominal surgery.

Materials and methods:

The study was conducted in the department of anaesthesiology, Rajendra institute of Medical sciences, Ranchi, following approval of hospital ethical committee. Our study was conducted on 60 patients, between the age of 21-50 years, of either sex (M/F) and belonging to ASA grade 1 and 2, admitted for lower abdominal surgery. Patients were randomly divided into two groups (30 patients in each group).

Group D: inj. 3 ml of Bupivacaine 0.5 % solution along with 0.5 ml (5mcg) of inj. Dexmedetomidine.

Group F: inj. 3 ml of Bupivacaine 0.5% solution along with 0.5 ml (25mcg) of inj. Fentanyl.

After taking detailed history and thorough systemic examination and necessary laboratory investigation, the patient was excluded from the study on the basis of below mention criteria.

1. Patient refusal.
2. Emergency surgeries.
3. Patient with ASA grade 3,4 and 5
4. Patients below 20 years of ae and above 50 years of age.
5. Severe anaemia, coagulations abnormalities and bleeding disorders.
6. Patient with spinal deformity
7. Patients with previous history of spinal surgery
8. Patients with active lesion over lumbosacral area.

Results: The demographic profile, which included patients age, height, weight, duration of surgery and ASA grading were similar and no significant difference was observed between the groups (Table no). There was no significant difference in the trend of systolic blood pressure, diastolic blood pressure or oxygen saturation (SPO2) among both groups. But there was significant decrease in heart rate in Dexmedetomidine group compared to Fentanyl group. The mean heart rate obtained in at various intervals of time was significantly lower within Dexmedetomidine group with a P value of <0.005.

Table no-1: Patient's demographics

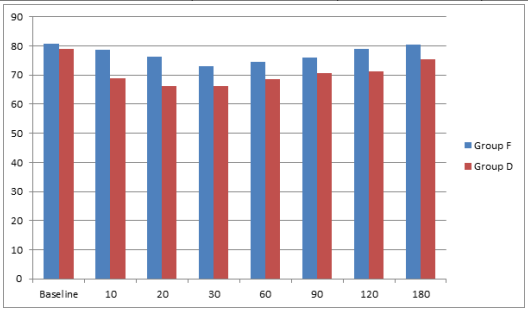
	Group F (n=30)	Group D (n=30)	p- value
Age (years)	39.80+8.27	39.80+7.57	0.872
Height (cm)	162.53+5.59	162.30+5.43	0.464
Weight (kg)	55.03+6.96	55.93+6.67	0.929
Duration of surgery (min)	103.50+21.97	104.00+20.33	0.584
ASA grade ½	25/5	24/6	

The mean onset time of sensory block (T10) was faster in group D (3.80+.50 min) followed by Group F (3.88+.54 min).The difference between Dexmedetomidine and Fentanyl group was not significant (p= 0.12); both of these are equally effective in reducing the time of onset of sensory block when compare to Bupivacaine alone.

While onset of motor block (Grade 3) in Group D was 5.76+ 0.67 min followed by Group F 6.23+0.77 min. the difference was statistically not significant between both group (p= 0.42).

Table no-2: Duration of sensory and motor block.

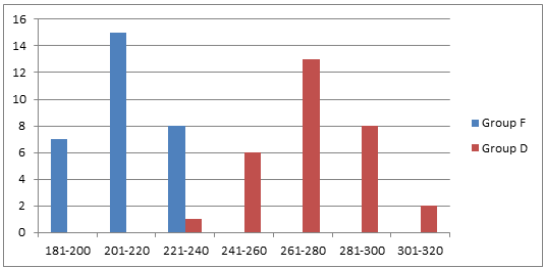
	Group F (n=30)	Group D (n=30)	p-value
Duration of sensory block (min)	172.90+6.78	279.33+10.14	0.001
Duration of motor block (min)	179.96+9.29	227.83+12.24	0.001



Duration (in minutes)

Graphs no1: Heart rate

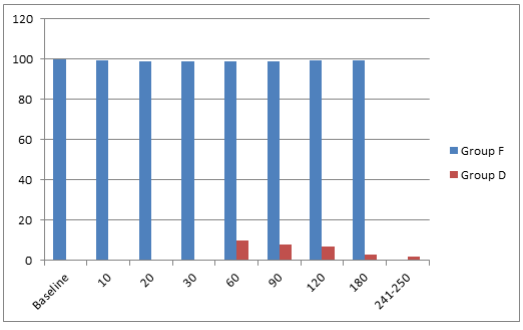
Duration of sensory regression to S1 level was 279.33+10.14 min in Group D and 172.90+6.78 min in Group F (p= 0.0001).Duration of motor blockade was Also maximum in Group D 227.83+12.24min followed by Group F 179.96+9.29 min (p=0.002).The sensory and motor block was more prolonged in Dexmedetomidine group than Fentanyl group showing significant difference among the two groups (p value).



Graph no2: Duration of sensory block (in minutes)

Peak sensory level attained was T4 for12 cases, T5 for 4 cases and T6 for 14 cases in Dexmedetomidin group whereas Fentanyl group had peak sensory level of T4 for 9 cases, T5 for 2 cases and T6 for 19 caseswithout significant difference between the groups. P= 1.000.

The mean effective analgesia as assessed by visual analog scale (VAS) >4 was 286.00+7.84 min in Group D followed by 190.96+8.21min in Group F which was highly significant difference statistically (p=0.001).



Graph no3: duration of motor block (in minutes)

Hypotension occurred in both groups but the difference was not significant. 7 patients in Dexmedetomidine group developed hypotension compared to 5 patients in Fentanyl group. 6 patients in Dexmedetomidine group were given Atropine injection following bradycardia compared to 0 patients in Fentanyl group. Statistically, no significant intergroup difference was observed. There were no complication, such as nausea, vomiting, shivering, itching, pruritus and respiratory depression in patients of either group.

Discussion:

In the present study, we assessed 60 patients aged 20-50 years belonging to ASA grade 1 and 2, posted for lower abdominal surgeries under spinal anaesthesia. The results of our study show that supplementation of spinal Bupivacaine with 5 mcg Dexmedetomidine significantly prolonged both sensory and motor block compared with intrathecal 25 mcg Fentanyl.

Time of onset of sensory and motor block was similar in both the D and F groups. These finding was similar with Mahendru V et al [5], who observed no difference in the onset time in patients receiving Dexmedetomidine (10.3±3.3 min) and Fentanyl (9.6±2.9 min)as adjuvants to hyperbaric Bupivacaine. Similarly, no significant difference in sensory onset time among study groups were also observed by Gupta R et al, [6] Kishore et al, [7] and Safari et al. [8]

Highest sensory block level and the time to reach the highest sensory block level were compared. No significant differences were noted between the two groups.

Similar result were also noted by Kishore et al, [7] Mehendru et al, [5] Gupta R et al.[6] Motor block onset time to modified bromage 3 was also observed but no statistically significant difference were found. Similar finding were noted by Gupta et al. Mehendru V et al. and Kishore et al.

Two segment sensory regressions from highest sensory block level; sensory block regression to S1 level and motor block regression to modified Bromage 0 was compared between these two groups. The difference for this entire three parameters were very much statistically significant ($p<0.0001$). These finding clearly states that Dexmedetomidine as an adjuvant provided prolonged sensory and motor duration as compared to Fentanyl used in spinal anaesthesia. Similar finding was also observed by Gupta et al, Mehendru et al, Safari et al, Khan et al, [9] Suresh et al,[10] Sunil BV et al,[11]Nayagam HA et al,[12] and Routrey et al.[13]

The duration of analgesia is prolonged in Dexmedetomidine group when compared Fentanyl. The mean time for rescue analgesia was significantly higher with Dexmedetomidine. Similar finding occurred in various studies of Gupta et al, and Jamliya et al.[14]

Intrathecal Dexmedetomidine and fentanyl Bupivacaine did not have much effect on vital parameters except for decrease in heart rate in Dexmedetomidine group which was significant (p=<0.05). Similar observation was made by Mohammed et al[15]. It may be due to sympatholytic effect of Dexmedetomidine. Gupta et al, Al-Mustafa et al,[16] and Tarbeeh et al[17] did not find much change between the groups.

The patients in both the group had a sedation score of 2 and 3, which is not statistically significant with a p value p=>0.05. This may be attributed to the sedative effects of both the drugs.

The side effect like nausea, vomiting, hypotension decreases in saturation, pruritis and shivering during intraoperative and post-operative period were comparable (p=>0.05). Similar observation was noted in Gupta et al, Ogan et al,[18]and Bajwa et al[19].

Conclusion and scope

In our study, we concluded that the use of intrathecal Dexmedetomidine In dose of 5 mcg as an adjuvant to Bupivacaine seems it to be an attractive alternative to Fentanyl for surgical procedures. It provides good quality of intraoperative analgesia, haemodynamically stable conditions, minimal adverse effects, and excellent quality of post-operative analgesia without significant sedation.

However, prolonged duration of motor blockade with Dexmedetomidine may be undesirable for short term surgical procedures or ambulatory surgeries.

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