Enhancement of Spread of Spinal Analgesia by Systemic Analgesics (Opoids/Non-Opoids): A Comparison between Fentanyl and Paracetamol Injection

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Sometimes patients experience pain during surgery under sub-arachnoid block (SAB).This pain is usually be combated by small doses supplementation of different opoids/non-opoids analgesics. This study was intended to show whether intravenous paracetamol could the spread of spinal analgesia following intrathecal bupivacaine. Thirty patients were randomly allocated into three groups. Fifteen minutes after spinal anaesthesia, level of analgesia was assessed by inability to appreciate pin pricks and baseline level was defined. Then the patient of group A, group B & group C were injected through intravenous route 1 ml of normal saline,10 mg/kg paracetamol, 0.5 micro-gm/kg of fentanyl, respectively. The level of analgesia was reassessed in all the three groups at 25 & 35 minutes after SAB. Significant changes in the level of analgesia between group A&B and group A&C were observed both at 25 & 35 minutes after. So, it can be concluded that intravenous paracetamol in low dose lesser than intravenous fentanyl in enhancing the spread of analgesia produced after sub arachnoid block.

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Introduction

General anaesthesia has worldwide acceptability. Regional anaesthesia is also equally popular because of its some special characteristics. Regional techniques like subarachnoid block (SAB) may be preferred to general anaesthesia in surgery of lower abdomen, pelvis and lower limbs particularly in adults.[1] Some patients suffer from pain during different operative procedures under SAB. This may be due to inadequate analgesia up to the desired height.[2] These situations are usually be combated by supplementing small doses of intravenous (IV) analgesics and/or inhalation of nitrous oxide in oxygen. Systemic morphine has been shown to decrease spinal cord blood flow. This may reduce absorption of local anaesthtics, increasing duration rather than spread of sensory block.[2] Fassoulaki et al in a study have demonstrated that administration of small dose of intravenous fentanyl following intrathecal lignocaine significantly enhanced the spread of analgesia.[3]

In our country paracetamol injection is now available and also cheaper than fentanyl. This study was intended to show whether IV paracetamol in low dose has effect similar to that in fentanyl in enhancing the spread of analgesia following intrathecal Bupivacaine.

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Methods

Thirty patients scheduled for lower abdominal surgery were included in double blind randomized study. The protocol was approved by local authority. All patients were given detailed explanation of the procedures & informed consent were taken from all patients before admission to study. The patients with local skin infection, bleeding disorder, anatomical deformity of spine or with history of having previous spinal surgeries were excluded from study. Before anaesthesia a list was prepared in which the number 01 to 30 were allocated randomly to one of the three groups of 10 number each. The patients were placed on the list in order of recruitment.

On arrival to the operation theater – heart rate, blood pressure & SpO2 were recorded and a 20G canula was inserted into a suitable vein. All patients received an infusion of one litre Hartman's solution before induction of anaesthesia. Then sub-archnoid block was given 0.5%bupivacaine heavy 3 ml (15 mg). After block, the patient was immediately placed in supine position with head on one small pillow. Fifteen minutes after intrathecal injection, the level of analgesia was assessed by inability to appreciate pin pricks with a 21G hypodermic needle along the anterior & midaxillary line on both sides in a cephaloid to caudate direction. A base line level was thus defined.

The group A patients received 2 ml of IV normal saline. Then group B and C group were administered intravenously 500 mg paracetamol IV & fentanyl 0.5 microgm/kg body weight respectively. Ten minutes later (twenty-five minutes after SAB) the level of analgesia were reassessed and noted in all the three groups. The study terminated by assessing the level of analgesia after another ten minutes (thirty-five minutes after SAB). Heart rate, blood pressure, respiratory rate & SpO2 were recorded just after SAB, at 15 minutes, at 25 minutes, at 35 minutes after SAB & just after completion of surgery. Parametric data were analyzed by unpaired student's 't' test. A value of $P<0.05$ & $P<0.001$ were considered to be significant & highly significant respectively.

Results

There was no significant differences between the groups for age, sex & weight (Table I). Table II shows changes in the levels of analgesia from base line observation. At twenty five minutes after SAB i,e ten minutes after baseline observation, the changes between patient group A and group B and also between those of group A and group C were highly significant ($p<0.001$) (Table II).Thirty five minutes after sub-arachnoid block a significant changes in the level of analgesia between the patient's of group A and group B and between group A and group C were also observed (Table II).

There was increase in levels of analgesia both at 10 and 20 minutes after administration of IV fentanyl in group C and paracetamol in group B were observed. There was also decrease in the level of analgesia in patient's receiving IV normal saline (group-A).

At 35 minutes after sub-arachnoid block, there was a further decrease in level of analgesia in group A and group B patient's while group C patients showed further increase.

Table III shows heart rate, blood pressure, respiratory rate and arterial oxygen saturation (SpO2) at three points viz 15 minutes, 25minutes, and 35 minutes after SAB in all three groups. There were no significant differences in these parameters.

Table I: Patients characteristics. Mean(+-SD)

	Group-A	Group-B	Group-C
Age(years)	51.3+-(12.7)	57.1(+-8.8)	58.3(+-11.7)
Sex(M/F)	10/3	10/3	10/2
Weight(Kg)	57.1(+-5.1)	56.6(+-5.01)	53.6(+-3.89)

Table II: Changes in the levels of analgesia at 25 & 35 minutes following sub-arachnoid block,Mean(+-SD)

Groups	25 minutes after SAB(Cm)	35 minutes aft SAB(cm)
Group-A	0.22(+-o.7)	0.93(+-0.08)
Group-B	2.02(+-0.21)*	1.38(+-0.27)*
Group C	3.30(+-0.29)*	2.91(+-0.26)*

*p<o.001(Unpaired student's 't' test).

Table III: Mean(+SD) heart rate(HR) Respiratory rate(RR) Arterial oxygen saturation(SpO2) in three groups

Parameters	Period in minutes after SAB	Group-A	Group-B	Group-C
HR	15	106+-10	99+-8	103+-11
"	25	110+-10	100+-8	106+-14
"	35	109+-12	102+-9	100+-9
BP(Systolic/diastolic in mm of Hg)	15	106+-15/75+-10	104+-9/68+-8	108+-12/68+-8
	25	105+-9/68+-8	110+-11/70+-8	104+-11/67+-7
	35	106+-10/71+-9	108+-12/68+-8	111+-10/70+-8
RR(per minute)	15	15(+-2.4)	14.8(+-3.2)	14(+-2.5)
	25	14(+-2.8)	14.2(+-3.12)	13(+-2.1)
	35	14.5(+-3.1)	13.5(+-2.7)	13.2(+-1.9)
SpO2	15	96.8%(+-2.1)	97%(1.5)	98%(+-1.1)
	25	96%(+-2.3)	96.4%(+-1.9)	96.5%(+-1.8)
	35	97.1%(+-1.2)	95.2%(+-1.8)	96.6%(+1.8)

- P<0.001 (Unpaired student's 't' test.

Discussion

Fassoulki et al in their earlier study have shown that systemic Fentanyl enhances the spread of spinal analgesia produced by lignocaine.[3] The present study confirmed that the paracetamol inj. has similar effect. The paracetamol produced less increase in height of analgesia than fentanyl during the first 10 minutes but height of analgesia decreases in the next ten minutes in case of fentanyl. Inj. paracetamol maintains the analgesia level in the same extent after 20 minutes of IV injection. .

The mechanism of interaction between systemic opoids/paracetamol and bupivacaine is not clear.[3] Systemic morphine has been to decrease spinal blood flow.[2] This may reduce absorption of local anaesthetic, increasing the duration rather than the spread of sensory block. Fentanyl may act in a manner similar to morphin by disinhibiting a class of neuron

in the rostral ventromedial medulla involved in pain modulation.[5] The spread of analgesia which followed administration of fentanyl or paracetamol did not occur in group-A i,e, patients receiving normal saline. It is conceivable that subclinical analgesia above the level of complete analgesia produced by sub-arachnoid bupivacaine might be potentiated and become clinically detectable by small doses of systemic opoids/paracetamol.

It is apparent from the study that the regression of analgesic height towards the end of spinal bupivacaine anaesthesia can be delayed and also enhanced by using small doses of systemic fentanyl as well as paracetamol inj. Paracetamol inj.is now available and cheaper in our country. Use of paracetamol inj. rather than fentanyl may, therefore be of more benefit in lower abdominal surgery.

Conclusion

The present study it is concluded that IV paracetamol has reduced effect of analgesia than of IV fentanyl inj.in enhancing the spread of spinal analgesia but analgesic effect remains more time than fentanyl.

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