ORIGINAL RESEARCH

Intrathecalchlorprocaine and chloroprocaine with fentanyl for short duration urological, perianal and lower limb surgeries: Hemodynamic changes

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ABSTRACT
Chloroprocaine is a short acting local anesthetic that is reliable and has a favorable safety profile to support the growing need for day care surgery.It is now being tested as a substitute for lidocaine in human spinal anesthesia. After obtaining the approval from institutional review board and the ethical committee, 60 ASA Grade I and Grade II patients who met inclusion and exclusion criteria who were undergoing short duration urology, lower limb and perianal surgeries were selected. In the present study, systolic blood pressure and mean arterial blood pressure readings were noted to be comparable between the two groups. Although baseline diastolic blood pressure readings and at 4, 50, 60, 70, 90, 100 minutes were noted to be comparable between the two groups but subsequent diastolic blood pressure values at 2, 6, 8, 10, 20, 30, 40, 80, 110 minutes were higher in Chloroprocaine with fentanyl group than Chloroprocaine with sterile water group and it was statistically significant. But the difference was not clinically significant and none of patient required pharmacological treatment.

Key words: Chloroprocaine, fentanyl, hemodynamic changes

INTRODUCTION

Complications associated with spinal anesthesia can be duetoeffectsofinjected drugs, incorrect placement of needle, injection of organisms, spinal compromise due to ischaemia or mass effect. Anticipation and prevention of complications along with their early diagnosis and treatment are the most important factors in dealing with regional anesthetic risks.[1]

Hypotension May be defined arbitrarily as fall in systolic blood pressure below 25% of baseline. Symptoms are related to the issue to the tissue hypoxia that results from the diminished blood pressure. Hypotension during spinal anesthesia is because of the physiologic effects of central neuraxial blockade, which can be classified into two major circulatory effects. First is paralysis of sympathetic vasoconstrictor fibers to the arterioles. Arteriolar dilatation results in a decreased in peripheral vascular resistance. The second is actual dilatation of peripheral veins and venuleswith pooling of blood. This combined with paralysis of skeletal muscle and the loss of muscular milking action plus the interference with the thoracic pumpdecreases venous return.[2]

Bradycardia and cardiac arrest may be because of predominance of Bain Bridge reflex. There is slowing of heart rate with decreased venous return, which is mediated by stretch receptors present at the junction of great vessels and right atrium. Treatment is to give atropine (0.6mg) intravenously.[3]

Chloroprocaine is a short acting local anesthetic that is reliable and has a favorable safety profile to support the growing need for day care surgery.It is now being tested as a substitute for lidocaine in human spinal anesthesia

Its rapid hydrolysis reduced the possibility of systemic toxicity, but its usefulness was restricted to procedures of short duration that did not produce a

high degree of postoperative pain. In modern regional practices, it has been used both in spinal anesthesia and in nerve blocks for short, relatively painless procedures.[4]

METHODOLOGY

STUDY DESIGN: Double Blind Randomised Controlled Study.

STUDY POPULATION: After obtaining the approval from institutional review board and the ethical committee, 60 ASA Grade I and Grade II patients who met inclusion and exclusion criteria who were undergoing short duration urology, lower limb and perianal surgeries were selected.

STUDY DURATION: From preanesthetic evaluation until complete regression of motor and sensory block. Discontinuation criteria: Failed subarachnoid blocks, patients complaining of pain intraoperatively due to block regression before the surgery is completed.

SAMPLE SIZE DETERMINATION: With5%levelofsignificance and 80% power, the required sample size varies from 14 to 36. To strengthen the power of the study the required sample size is rounded to 60; 30 for Chloroprocaine group and 30 for Chloroprocaine with Fentanyl.

SAMPLING TECHNIQUE: These patients were randomly allocated into two groups by a computer generated randomization chart with 30 in each group

- **GROUP A:** Patients received 35mg of preservative free, isobaric 1% chloroprocaine hydrochloride with 0.5mL of sterile water intrathecally (4mL).
- **GROUP B:** Patients received 35mg of preservative free, isobaric 1% chloroprocaine hydrochloride with Injection fentanyl 25mcg (0.5mL) intrathecally (4mL).

RESULTS

Table 1: Comparison of Mean Heart rate (beats per minute) between the two groups (unpaired t-Test)

Heart Rate(Beats/Minute)	Chloroprocaine (F(%)/Mean±SD)	Chloroprocaine with Fentanyl (F(%)/Mean±SD)	P Value
0 Min	83±13.676	75.67±10.42	0.023*
2 Min	80.57±12.795	74.6±10.759	0.055
4 Min	79.13±12.542	72.9±10.784	0.043*
6 Min	79.37±12.062	70.9±10.257	0.005*
8 Min	77.43±11.962	68.5±9.424	0.002*
10 Min	77.03±11.491	66.7±8.945	<0.001*
20 Min	76.97±12.175	64.8±8.624	<0.001*
30 Min	76.87±11.741	63.87±7.7	<0.001*
40 Min	76.4±11.749	63.03±7.439	<0.001*
50 Min	76.93±12.242	63.2±7.383	<0.001*
60 Min	77.57±11.325	64.33±6.666	<0.001*
70 Min	79.07±11.203	66.03±7.867	<0.001*
80 Min	79±10.168	67.93±7.158	<0.001*
90 Min	78.57±10.371	69.83±7.278	<0.001*
100 Min	78.1±9.841	70.87±7.267	0.002*
110 Min	79.3±10.114	71.67±7.457	0.002*

*-Significant

The Mean heart rate at 10minutes, over interval of 10 minutes for next 80 minutes between the two groups was statistically significant.

Table 2:Comparison of Mean Systolic blood pressure (mm Hg) in between the two groups (unpaired t-Test)

SBP in Minutes	Chloroprocaine (F(%)/Mean±SD)	Chloroprocaine with Fentanyl (F(%)/Mean±SD)	P Value
0 Min	128.733±14.353	124.5±15.62	0.279
2 Min	126.633±13.962	121.9±15.419	0.218
4 Min	123±16.233	118.367±16.236	0.274
6 Min	121.567±15.991	117±14.89	0.257
8 Min	121.7±15.996	115.8±15.158	0.148
10 Min	120.733±16.269	114.233±14.924	0.112
20 Min	120.5±16.747	113.733±15.405	0.109
30 Min	120.2±16.765	114.4±15.573	0.17

40 Min	121.133±16.94	114.667±14.798	0.121
50 Min	121.667±16.886	116.067±14	0.167
60 Min	122.233±15.939	117.267±14.57	0.213
70 Min	123.8±15.643	118.5±14.28	0.176
80 Min	125.367±15.506	119.833±14.37	0.157
90 Min	125.933±16.44	121.267±14.851	0.253
100 Min	125.3±15.87	120.833±15.514	0.275
110 Min	126.267±15.367	121.9±13.971	0.254

The Mean (SD) systolic blood pressure at baseline, over interval of 2 minutes for first 10 minutes and at 10minutes interval for next 110 minutes between the two groups was not statistically significant.

Table 3: Comparison of Mean Diastolic blood pressure (in mm Hg) in between the two groups (unpaired t-Test)

DBP in Minutes	Chloroprocaine (F(%)/Mean±SD)	Chloroprocainewith Fentanyl (F(%)/Mean±SD)	P Value
0 Min	77.1±7.631	80.5±11.892	0.193
2 Min	72.4±8.771	78.7±10.674	0.015*
4 Min	71.1±8.64	76.067±11.048	0.057
6 Min	70.333±7.581	75.633±10.653	0.03*
8 Min	68.967±6.651	74.267±10.703	0.025*
10 Min	67.967±6.02	73±10.57	0.027*
20 Min	67.1±5.585	72.367±10.193	0.016*
30 Min	67.2±5.616	72.367±10.397	0.02*
40 Min	67.167±5.14	72.1±10.486	0.024*
50 Min	68.1±6.713	72.167±9.938	0.068
60 Min	70.067±6.368	73.133±9.619	0.151
70 Min	70.933±6.56	74.833±9.381	0.067
80 Min	71.3±6.282	75.567±8.744	0.034*
90 Min	71.5±5.829	75.267±8.804	0.056
100 Min	72.167±5.754	74.9±8.652	0.155
110 Min	71.4±5.411	76.067±8.614	0.015*

*-Significant

The Mean (SD) diastolic blood pressure at 2, 6, 8, 10, 20, 30, 40, 80, 110 minutes were higher in chloroprocaine with fentanyl group than Chloroprocaine with sterile water group and it was statistically significant.

Table 4: Comparison of Mean blood pressure (in mm Hg) in between the two groups (unpaired t-Test)

MAP(mmHg)	Chloroprocaine (F(%)/Mean±SD)	Chloroprocainewith Fentanyl (F(%)/Mean±SD)	P Value
0 Min	94.311±7.189	95.167±9.784	0.701
2 Min	90.478±7.672	93.1±8.466	0.214
4 Min	88.4±8.11	90.167±8.991	0.427
6 Min	87.411±7.812	89.422±8.519	0.345
8 Min	86.544±7.165	88.111±8.617	0.447
10 Min	85.556±6.939	86.744±8.667	0.56
20 Min	84.9±6.858	86.156±8.488	0.531
30 Min	84.867±6.573	86.378±8.942	0.459
40 Min	85.156±6.237	86.289±8.853	0.569
50 Min	85.956±7.231	86.8±8.535	0.681
60 Min	87.456±6.513	87.844±8.298	0.841
70 Min	88.556±6.386	89.39 ±8	0.657
80 Min	89.322±6.431	90.322±7.345	0.577
90 Min	89.644±6.586	90.6±7.571	0.604
100 Min	89.878±6.545	90.211±7.641	0.857
110 Min	89.689±6.21	91.344±7.371	0.351

The Mean blood pressure at baseline, over interval of 2 minutes for first 10 minutes and at 10 minutes interval for next 110minutes between the two groups was not statistically significant.

DISCUSSION

Table 5: Comparison of haemodynamics

Study	Drugs used	SBP/DBP	Heart rate
Kararmaz A *et al.* [5]	4mg B+ 25μg F+DW	Group B (Bupivacaine) was significantly lower than Group F(Bupivacaine with fentanyl) (p= 0.015)	
	7.5mg 0.5% B		
Ozguncuvas *et al.* [6]	12.5mg 0.5%LB	Similar in both groups (p>0.05)	
	11mg 0.5%LB+15 μgF		
Vaghadia*et al.*[7]	35 mg 2% L+15μg F	-	-
	40mg 2% CP+15μg F	-	-
Lacasse*et al.* [8]	40mg 2% CP	-	-
	7.5mg 0.75% B	-	-
Vath and Kopacz[9]	40mg 2%CP+saline	-	-
	40mg 2%CP+20μg F	-	-
Present study	35mg 1%CP+0.5mL DW	SBP is comparable between groups. DBP in fentanyl group is significantly more than CP group at some interval	HR in fentanyl group is significantly less than CP group at some intervals(p<0.001)
	35mg 1%CP+ 25μg F		

CP-Chloroprocaine, B-Bupivacaine, L-Lignociane, DW-Distill water, F-Fentanyl, SW-Sterile water, LB-Levobupivacaine

Not many studies have compared on hemodynamic changes between the groups. In the present study, heart rate noted in Chloroprocaine with fentanyl group was less compared to Chloroprocaine with sterile water groupwhichwasstatistically significant. But none of the patient in either group required pharmacological treatment as it was not clinically significant.

In the present study, systolic blood pressure and mean arterial blood pressure readings were noted to be comparable between the two groups. Although baseline diastolic blood pressure readings and at 4, 50, 60, 70, 90, 100 minutes were noted to be comparable between the two groups but subsequent diastolic blood pressure values at 2, 6, 8, 10, 20, 30, 40, 80, 110 minutes were higher in Chloroprocaine with fentanyl group than Chloroprocaine with sterile water group and it was statistically significant. But the difference was not clinically significant and none of patient required pharmacological treatment.

Though in Kararmaz A *et al.* study, fentanyl group had higher hemodynamics compared to bupivacaine group which can be explained by lesser local anesthetic used in fentanyl group. The differences observed in the present study which was statistically significant in diastolic blood pressure and heart rate could not be compared with other Chloroprocaine studies as hemodynamics were not commented.[10]

CONCLUSION

The systolic and mean blood pressure at baseline, over interval of 2 minutes for first 10 minutes and at 10 minutes interval for next 110minutes between the two groups was not statistically significant.

The Mean (SD) diastolic blood pressure at 2, 6, 8, 10, 20, 30, 40, 80, 110 minutes were higher in chloroprocaine with fentanyl group than Chloroprocaine with sterile water group and it was statistically significant.

The Mean heart rate at 10minutes, over interval of 10 minutes for next 80 minutes between the two groups was statistically significant.

REFERENCES

1. Wang JK, Nauss LA, Thomas JE. Pain relief by intrathecally applied morphine in man. Anesthesiology 1979; 50: 149–51
2. Chilvers C, Vaghadia H, Mitchell G, Merrick P. Small-dose hypobaric lidocaine-fentanyl spinal anesthesia for short duration outpatient laparoscopy. II. Optimal fentanyl dose. AnesthAnalg. 1997;84:65-70.
3. Ben-David B, Solomon E, Levin H, *et al*. Intrathecal fentanyl with small-dose dilute bupivacaine: better anesthesia without prolonging recovery. AnesthAnalg 1997;85:560–5
4. Etches RC, Sandler AN, Daley MD. Respiratory depression and spinal opioids. Can J Anaesth 1989;36:165-85.
5. Kararmaz A, Kaya S, Turhanoglu S, Ozyilmaz MA. Low dose bupivacainefentanyl spinal anaesthesia for transurethral prostatectomy. Anaesthesia. 2003 Jun;58(6):526-30.
6. Turkyilmaz e, Sunay MM. Spinal anesthesia for transurethral resection operations: levobupivacaine with or without fentanyl Ozguncuvas, Hulyabasar, Aydan Yeygel.Department of Anesthesiology American University of Beirut Medical Center PO Box 11-0236. Beirut 1107-2020, Lebanon.:547.
7. Camponovo C, Wulf H, Ghisi D, Fanelli A, Riva T, Cristina D, Vassiliou T, Leschka K, Fanelli G. Intrathecal 1% 2 chloroprocaine vs. 0.5% bupivacaine in ambulatory surgery: a prospective, observer blinded, randomised, controlled trial. ActaAnaesthesiologicaScandinavica.2014 May;58(5):560-6.
8. Marie-Andre´eLacasse, MD • Jean-Denis Roy, MD • Jose´e Forget, MD •Franck Vandenbroucke, MD. Comparison of bupivacaine and 2-chloroprocaine for

spinal anesthesia for outpatient surgery: a double-blind randomized trial Can J Anesth/J Can Anesth (2011) 58:384-391
9. Vath JS, Kopacz DJ. Spinal 2-chloroprocaine: the effect ofaddedfentanyl. AnesthAnalg 2004; 98: 89-94.
10. Wang BC, Hillman DE, Spielholz NI, Turndorf H. Chronic neurological deficits and Nesacaine-CE-an effect of the anesthetic, 2-chloroprocaine, or the antioxidant, sodium bisulfite? AnesthAnalg. 1984;63(4):445-447.