



Anaesthesiology

COMPARISON OF INTRA OPERATIVE EFFECTS AND POST OPERATIVE OUTCOME BETWEEN INTRATHECAL CHLOROPROCAINE AND CHLOROPROCAINE WITH FENTANYL FOR URETEROSCOPIC LITHOTRIPSY.

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KEYWORDS :

INTRODUCTION

With the advent of Ambulatory surgery, the search for an ideal anaesthetic for outpatient spinal anaesthesia is ongoing.⁽¹⁾ An ideal anaesthetic is one that provides rapid onset of action, adequate potency, predictable duration with decreased side effects.⁽²⁾ Among the various local anaesthetics available, Chloroprocaine – an amino ester – has been the forerunner in satisfying these criteria. It was first introduced in the year 1952 by Foldes and McNall and was found to be superior in efficacy and safety as compared to Procaine and Lidocaine.⁽³⁾ However, due to reports of neurological deficits following intrathecal administration of chloroprocaine, in the early 1980s, its use drastically decreased and low dose Bupivacaine was preferred.⁽⁴⁾ Extensive investigation revealed that a combination of low pH and sodium bisulfite, an antioxidant, could be the cause of neurotoxicity. Hence, an anti-oxidant and preservative free 2-chloroprocaine was developed and is now one of the preferred drugs for short duration spinal anaesthesia.⁽⁵⁾

Intrathecal opioids prolong the duration of sensory blockade without prolonging motor recovery. Vath et al. reported the characteristics of 2-chloroprocaine spinal anaesthesia with or without fentanyl in 8 volunteers receiving 40mg 2-Chloroprocaine with saline or 20 micrograms fentanyl and found that the addition of fentanyl lengthens regression to L1 and tourniquet tolerance while minimally lengthening block duration.⁽⁶⁾ Ben-David et al. showed that the time to reach peak sensory level and motor recovery was earlier with intrathecal Bupivacaine with 25mcg Fentanyl as compared to plain Bupivacaine for elective caesarean section, while the time to two segment regression and complete sensory recovery was faster without fentanyl.⁽⁷⁾ Therefore, the primary objective of this study was to explore the effect of adding intrathecal fentanyl on the quality, duration, and recovery from 2-CP spinal anaesthesia using a volunteer model.

METHODOLOGY

After obtaining institutional ethics committee approval, 50 patients aged between 18 to 60 years belonging to either sex, undergoing ureteroscopy for ureteric calculi, were included in the study. All patients were visited on the day prior to surgery and a detailed preoperative evaluation was done. After explaining the anaesthetic procedure and the risks and benefits associated with the same, written and informed consent was obtained. Routine investigations like hemoglobin, blood grouping, blood urea, serum creatinine, coagulation profile and blood sugar were done. ECG and chest X-ray were considered whenever indicated. Preoperatively pulse rate, respiratory rate and blood pressure were noted.

Patients were advised fasting for at least 6 hours prior to the procedure and premedicated with Tablet Ranitidine 150mg and Tablet Diazepam 5mg the night before surgery. On arrival at the operating room, the patient received one of the following doses of the study drug: Group CP (N=25) received 40mg 1% Chloroprocaine with 0.5 ml Normal Saline

Group CP+F (N=25) received 40mg 1% Chloroprocaine with 25mcg Fentanyl

The drug was administered by an experienced anaesthesiologist. An intravenous line was secured with 20 gauge cannula and patients was preloaded with a suitable crystalloid IV fluid at 10ml/kg body weight

over 20 minutes. Standard Monitors like pulse oximetry, noninvasive blood pressure (NIBP) and electrocardiogram (ECG) were connected to the patient. Baseline heart rate, Blood pressure and SpO₂ were recorded using multi-parameter monitor, before starting the procedure.

Under aseptic precautions, with the patient in either right or left lateral position, L3-L4 interspace was palpated. After local infiltration of the skin with 2ml of 2% lignocaine, 25G Quincke spinal needle was introduced into the space using midline approach. According to their grouping, patients received an intrathecal injection of either 4ml of 1% Chloroprocaine (40mg) and 0.5ml Normal Saline or 4ml 1% Chloroprocaine (40mg) and 0.5ml Fentanyl (25mcg). After confirming free flow of CSF, the drug was administered over a duration of 10-15 seconds. Immediately after the injection, patient was turned supine and supplemented with 100% Oxygen at the rate of 5 Litres/min by facemask. The patient was immobilized for 5 minutes till the drug fixed after which the patient was put in lithotomy position and the surgical procedure was allowed to commence.

Intraoperatively, vital parameters like heart rate, non invasive blood pressure, SpO₂ was recorded every minute for the first five minutes, every five minutes for the next twenty minutes, then, every ten minutes till the end of surgery and postoperatively, every fifteen minutes till the patient complained of pain.

For statistical analysis, Comparisons of dermatomal regressions, anthropometric and hemodynamic data were made using repeated-measures analysis of variance (ANOVA). For all other measurements, paired student's t-test was used. Unless otherwise specified, data are mean +/- SD, with significance defined as P < 0.05. The data obtained was entered in Microsoft Excel and statistical analysis done using Stata version 14.

RESULTS

Spinal anaesthesia was successfully performed for all subjects and in no case was general anaesthesia required to complete surgery. There were 35 males and 15 females aged 37+/-11 years, weighing 62+/-7 kg and 161+/- 5.4 cm height. No significant differences in anthropometric variables were reported between the two groups (Table 1). The mean duration of surgery in Group CP was 27.6 minutes and in Group CP+F was 28.07 minutes.

Table 1 : Anthropometric Variables

	CP	CP+F	P VALUE
MALES	17 (68%)	18 (72%)	0.48
FEMALES	8 (32%)	7 (28%)	
AGE	37+/-10	40+/-11	0.35
WEIGHT	59.6+/-5.36	64.73+/-8.97	0.27
HEIGHT	161.12+/-4.91	162.3+/-6.01	0.43
BMI	23.01+/-2.53	23.38+/-3.56	0.52

Key sensory and motor characteristics of the spinal anaesthetic blocks are summarized in Table 2. Notably the peak block height was higher and the time to achievement of peak block height was faster in the fentanyl group. The addition of intrathecal fentanyl resulted in significantly longer sensory blockade as demonstrated in the time to L1 regression and complete sensory regression. All patients were able to ambulate after full recovery of pin prick sensation to S2 dermatome in both groups, and all were deemed appropriate to discharge once these goals were achieved.

Table 2 : Spinal Block Characteristics

	CP	CP + F	P VALUE
SENSORY			
Peak block height	T8 (T6-T10)	T6 (T5-T10)	<0.001
Time to peak (min)	7.94 +/- 0.68 min	5.08 +/- 0.65 min	0.02
2-Segment regression	65.01 +/- 9.33 min	78.54 +/- 8.63 min	0.01
Complete regression to S2	81.86 +/- 3.228 min	100.14 +/- 6.585 min	0.03
MOTOR			
Time to Bromage 3	9.02 +/- 1.01 min	7.8 +/- 1.53 min	0.03
Duration (return to Bromage 0)	74.29 +/- 3.46 min	76.14 +/- 3.851 min	0.01
Time to ambulation (min)	81.86 +/- 3.228 min	100.14 +/- 6.585 min	0.02
FIRST DOSE OF POST OP ANALGESIA	90.32 +/- 9.08 min	110.67 +/- 10.325 min	0.02
SIDE EFFECTS			
Pruritis	-	10	
Vomiting	-	5	

There were no serious complications. 10 patients in the fentanyl group experienced pruritis, ranging from moderate in severity, which regressed and disappeared as the block resolved. No participant required treatment for pruritis. 5 patients had nausea and vomiting which was treated appropriately. Follow up revealed no cases of spinal headache or backache and none of the participants had symptoms consistent with TNS.

DISCUSSION

The primary finding of this study is that the addition of 25 mcg of intrathecal fentanyl to 2-CP spinal anesthesia significantly prolongs sensory blockade but only minimally lengthens motor blockade.

Regression of block to L1 was lengthened by 13 minutes on average. Although there was 18-min delay in ambulation for the fentanyl group, all subjects were able to ambulate within 110 min after injection. Motor block, as assessed by Bromage scale, demonstrated a longer time to recovery of lower extremity movement (by 2 minutes) in the fentanyl group.

It is known that intrathecal local anesthetics are nonselective in their blockade of afferent and efferent pathways. However, adjuvants or additives are often used with local anesthetics for their synergistic effect. The addition of opioids has an effect on the afferent nociceptive fibers without an effect on sympathetic efferent fibers.⁽⁸⁾ The opioids potentiate antinociception of local anesthetics by G protein coupled receptor mechanisms by causing hyperpolarisation of the afferent sensory neurons and have found to cause depression of A, delta and C fibres.⁽⁶⁾ Liu et al. studied 8 volunteers receiving intrathecal 5% lidocaine with and without fentanyl, showing that fentanyl lengthened the duration of tolerance to tourniquet pain without delaying motor blockade or time to void.⁽⁹⁾ A study conducted by Yesuf et al. in 100 patients undergoing emergency caesarean section showed that the addition of intrathecal fentanyl increased the duration of analgesia and reduced post operative analgesic consumption.⁽¹⁰⁾ A study by Bhaskara et al. comparing intrathecal chloroprocaine with fentanyl and Ropivacaine with fentanyl for perianal surgeries, demonstrated that addition of fentanyl potentiated afferent sensory blockade, facilitated reduction in dose of local anaesthetic without intensifying motor block or prolonging recovery.⁽¹¹⁾

Chloroprocaine maybe considered an ideal choice for short duration surgeries lasting 30–40 minutes. A retrospective analysis by Yoos et al showed that Chloroprocaine with or without fentanyl was the most common combination used for ambulatory procedures and were effective for surgeries of one hour duration.⁽¹²⁾ Saporito et al. conducted a meta-analysis of blinded, randomised studies comparing intrathecal low-dose (≤ 10 mg) hyperbaric bupivacaine to 2- chloroprocaine which

concluded that CP has a shorter motor block duration, a significantly quicker time to ambulation and time to discharge compared to low dose hyperbaric bupivacaine and may be advantageous when spinal anesthesia is performed for day care surgery.⁽¹³⁾ However, unless the physician is confident that the considered procedure will be completed within the stipulated time, CP is not recommended.

Therefore, the addition of opioids implements adequacy of spinal block without significant prolongation of discharge time. A randomized controlled trial by Kaushik et al comparing intrathecal isobaric Ropivacaine and Ropivacaine with fentanyl showed that there significant prolongation of sensory block and post operative analgesia when fentanyl was added.⁽¹⁴⁾ Fentanyl is a synthetic lipophilic opioid with a rapid onset of action and fewer tendencies to migrate rostrally and cause respiratory depression as compared to Morphine. Hence it has been widely used to augment intrathecal analgesia.⁽¹⁵⁾

Forty percent of the patients that received fentanyl experienced pruritis, which could have been diminished with mild sedation. However, it was mild in intensity and subsided without need for treatment. Moreover, Pruritis has been found to be a known side effect of intrathecal fentanyl.⁽¹⁶⁾ Five subjects in the fentanyl group complained of nausea and vomiting which was treated with antiemetic. The hemodynamic parameters were within normal range and there was no significant hypotension or bradycardia and no signs of respiratory depression. On 24 hr follow up, none of the patients experienced headache, backache or any symptoms of neurotoxicity.

Although the CP currently being used for spinal anesthesia is bisulfite free and the dose used is very low, physicians are often reluctant to use chloroprocaine due to its controversial history of causing neurotoxicity.⁽¹⁷⁾ One of the drawbacks of the study was its small sample size and large scale clinical trials would be necessary for further evaluation of the safety of chloroprocaine.

In conclusion, we found that the addition of intrathecal fentanyl significantly prolonged sensory blockade while only minimally extending the time to ambulation, void, and discharge. Therefore, 2-CP (40 mg) and fentanyl (25 mcg) may be an ideal anaesthetic combination for use in spinal anesthesia for short duration procedures.

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