ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 10 | October - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TO EVALUATE THE EFFICACY OF FENTANYL AS ADJUVANT TO BUPIVACAINE IN INTRAOPERATIVE ANALGESIA IN ULTRASOUND GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK.

Anaesthesiology

Dr. D. Gowri Mahesh Postgraduate,Department of Anaesthesiology,Alluri Sitarama Raju Academy of Medical Sciences ,Eluru, West Godavari District Andhra Pradesh 534005, India.

Dr. B. S. T. Sai Associate Professor, Department of Anaesthesiology, Alluri Sitarama Raju Academy of Medical Sciences Eluru, West Godavari District, Andhra Pradesh 534005, India.

Dr. Murali Krishna Chava* Associate Professor, Department of Anaesthesiology, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, West Godavari District, Andhra Pradesh 534005, India. *Corresponding Author

Dr. A. Anitha Post Graduate, Department of Anaesthesiology, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, West Godavari District, Andhra Pradesh 534005, India.

ABSTRACT

BACKGROUND: A clinical study was undertaken in 64 patients belonging to ASA 1 and 2 scheduled for elective upper limb surgeries to evaluate of the efficacy of 0.0002% fentanyl as an adjuvant with 0.5 % bupivacaine compared to 0.5% bupivacaine alone by supraclavicular brachial plexus block. This study was undertaken to compare the onset of analgesia, sensory and motor block duration and hemodynamic effects with fentanyl as an adjuvant to bupivacaine in supraclavicular brachial plexus block.

MATERIALS AND METHODS: This is a prospective study done in department of Anaesthesiology, Alluri Sitarama Raju Academy Of Medical Sciences, Eluru, on 64 patients who underwent upper limb surgeries for a period of 1 year from August 2018 to July 2019.

Of 64 patients Group 1 was administered 0.5% Bupivacaine 30 ml and Group II was administered Bupivacaine 30 ml plus 0.0002% (2mcg/ml) Fentanyl. During the procedure onset of time of analgesia and sensory and motor blockade duration in both groups were recorded. Post operative haemodynamic variables and rescue analgesic doses were also recorded.

Results: The mean difference in onset of analgesia was similar in both group and was statistically insignificant in this study. Onset of duration of motor block was statistically significant in Group II (Bupivacaine + Fentanyl) compared to Group I (Bupivacaine alone), where p was <0.00. Even mean duration of sensory and motor block was significantly delayed in group II compared to group I ($p < 0.05$). Rescue analgesic requirements were significantly less in Group II (Bupivacaine + Fentanyl) compared to Group I (Bupivacaine alone) where $p < 0.00$. Haemodynamics results during the postoperative care did not showed any difference in both groups.

CONCLUSION: In conclusion we found improved intraoperative anaesthesia and postoperative analgesia with minimal differences in hemodynamics with Bupivacaine 30 ml plus 0.0002% (2mcg/ml) Fentanyl injection but delayed the onset of motor and sensory block when compared with 0.5% Bupivacaine 30 ml injection.

KEYWORDS

Brahcial Plexus, ASA, Bupivacaine, Fentanyl, Upper limb

INTRODUCTION:

Pain is an unpleasant sensation which the individual himself can appraise and as such, incapable of a satisfactory definition. The effects of postoperative pain are mostly psychological, causing distress and anxiety and can be associated with autonomic disturbances such as sweating and nausea. Good postoperative pain relief can reduce the metabolic response to trauma and better mobility with immediate benefits of the low incidence of deep vein thrombosis and pulmonary complications.

Brachial plexus block is a valuable adjunct to general anaesthesia in patients undergoing upper limb surgeries. The techniques of peripheral nerve blockade has been expanded from the operative site into the area of postoperative and chronic pain management. The ultrasound guided brachial plexus block will provide comparatively best and reliable results in upper limb surgeries due to minimal usage of local anaesthetic solution and also reduces the access -related complications [1,2], such as pneumothorax and vascular injury, and increases block success.

Various local anaesthetic drugs are proved to be safe and beneficial for various upper and lower limb surgeries that cause neural blockade by inhibiting the transmission of impulses. Bupivacaine is one among them, at 0.25%, 0.5% concentrations it was proved four times more analgesic effect than lignocaine, but slower in onset of analgesia however it has a significantly longer duration of action [3,4]

Various brachial plexus block studies have shown that the addition of opioids like fentanyl to the local anesthetic drugs prolonged the duration and the efficacy of analgesic effect[5,6].

So, in the present study we examined the efficacy of fentanyl added to the bupivacaine block in the onset of analgesia, duration of motor and sensory block when compared to bupivacaine alone.

METHODS:

This study was approved by institutional ethics committee and all the patients who met with inclusion and exclusion criteria were only enrolled. All patients were given written consent form before their enrolment.

Methodology: This is a prospective study done in department of Anaesthesiology, Alluri Sitaramaraju Academy of Medical Sciences, Eluru, on 64 patients who underwent upper limb surgeries for a period of 1 year from August 2018 to July 2019

Inclusion and Exclusion criteria:

A total of 64 patients were enrolled in this study. All patients aged between 18-60 years and both genders with American Society of Anaesthesiologists physical status Classes (ASA) grade I and II who were planning for elective upper limb surgeries under supraclavicular brachial plexus block were only included. Patients who enrolled in this study were obtained written informed consent form.

Patients who refused to give written consent form, ASA grade III and above with any history of allergic reactions to anaesthesia and patients with peripheral neuropathy and coagulopathy were excluded.

Data Collection:

Data about previous medical history regarding anaesthesia and surgery, any significant medical illness, medications and allergy were recorded. Clinico demographic factors like complete physical examination, age, body weight, preoperative blood pressure and pulse rate were also collected.

Study groups:

Of 64 patients, patients equally divided (n=32) into two group where group I was given 0.5% bupivacaine 30ml, and group II was given 0.5% bupivacaine 30ml with 0.0002% fentanyl (2mcg/ml).

Treatment Procedure:
On arrival in the operating room intravenous access was secured with 18G IV cannula followed by administration of IV fluids. Then the following monitors were connected- Pulse oximeter, Electrocardiogram and Non invasive blood pressure monitor. Block has been performed after real-time visualization of the vessels, nerves, and bones with an "in-plane approach." Procedure done using Sonoray ultrasonogram machine with10-16 MHz transducer by the "in-plane approach" using a 20G spinal needle. After sterile preparation of the skin, the procedure site is draped. The brachial plexus is visualized by placing the transducer in the sagittal plane in the supraclavicular fossa behind the middle-third of the clavicle. Two distinct appearances of the brachial plexus are seen at the supraclavicular region; it either appeared as 3 hypoechoic circles with hyperechoic outer rings or as a grape-like cluster of 5 to 6 hypoechoic circles, located lateral and superior to the subclavian artery between the anterior and middle scalene muscles at the lower cervical region.

A 20 G spinal needle is connected to a 10 cm extension line, which in turn is connected to a 10 cc disposable syringe containing the local anaesthetic solution. The whole line is primed with the drug. Then the needle is inserted from the lateral end of the transducer from the lateral to medial direction, and the needle movement is observed in real-time. Once the needle is in the plexus, a predetermined volume of 30 ml of local anaesthetic solution is administered after negative aspiration to avoid accidental intravascular needle puncture, and the spread of local anaesthetic drugs is observed in tissue planes. Initially, the needle is placed deep in the more caudal elements of the plexus so that the brachial plexus rises closer to the skin surface with the injection of local anaesthetic solution. The spread of drug around the considered nerves is continuously evaluated under sonographic vision, and needle tip position is continually adjusted with minimum movements during injection under the sonographic vision to optimize the impregnation of nerve structures. The multiple injection technique is used to deposit the total amount of drug. 3-minutes massage is performed to facilitate even drug distribution.

STATISTICALANALYSIS:
The data was computed and all values expressed as mean ± SD. The normal distribution of measurement data is by the Kolmogorov – Smirnov test for normality test. Mann Whitney U test or Student's t-test is used between groups for continuous variables to find out the significance. Pearson's chi-square test or Fisher's exact test is used to find out the significance of categorical variables. Pearson or Spearman's rank correlation is calculated to find the association of assessed data with socio-demographic and clinical data. The statistically significant difference level is set at $p<.05$. All statistical analysis is conducted using the SPSS version 25.0 trial version (IBM Corp., Chicago, IL)

RESULTS:
Demographic factors are showed in table 1. Of 64 patients equal numbers of patients were divided into two groups.

Table1: Demographic factors of two groups

Variables	Bupivacaine Alone Block	Bupivacaine Plus Fentanyl Block	p value
Age (in mean years)	38.06±12.67	42.25±12.83	0.234
Sex Male Female	20 12	24 08	0.28
Height in cm (mean ± SD)	159.94±8.13	158.66	0.47
Weight in kgs (mean ± SD)	62.97±8.37	63.55±8.23	0.757

In the present study, the mean and SD of age of group I (Bupivacaine Alone Block) and group II (Bupivacaine plus Fentanyl Block) are 38.06±12.67 years and 42.25±12.83 years respectively and showed no much difference between two groups. Similarly, there was no difference between the gender distribution among the groups. In our study, the mean and SD of the height of the patients were 159.94 (±8.13) cm and 158.66 (±6.02) cm in group I and II respectively. The mean weight of the patients in group 1 was 62.97 with SD of 8.37 kg and that of group II was 63.56 with SD of 8.23. Mean values did not showed any clinically significance this study where p was >0.05.

Table 2 : Data showing the distribution of clinical variables (HR, SBP, RR and SPO2) between the groups after block

Groups		Mean	Standard Deviation	Minimum	Maximum	P value
HR	Bupivacaine Alone Block	79.12	7.20	64.00	90.00	0.145
	Bupivacaine Plus Fentanyl Block	78.91	5.43	66.00	86.00	
SBP	Bupivacaine Alone Block	119.06	15.00	90.00	160.00	0.405
	Bupivacaine Plus Fentanyl Block	115.12	8.78	100.00	130.00	
RR	Bupivacaine Alone Block	15.44	1.29	14.00	18.00	0.086
	Bupivacaine Plus Fentanyl Block	17.84	11.05	13.00	78.00	
SPO_2	Bupivacaine Alone Block	99.34	.87	97.00	100.00	0.423
	Bupivacaine Plus Fentanyl Block	99.50	.80	97.00	100.00	

The mean (± SD) values of HR, SBP, RR and SPO2 was compared between group I and II which did not show any significance (table 2).

Table 3: Comparison of Onset of analgesia, Motor and Sensory Block , duration of the surgery and number rescue medication given in both groups

Groups		Mean	Standard Deviation	Minimum	Maximum	P value
Onset Of Analgesia (min)	Bupivacaine Alone Block	17.25	1.74	14.00	20.00	0.066
	Bupivacaine Plus Fentanyl Block	18.12	1.58	16.00	21.00	
Onset Of Motor Block (min)	Bupivacaine Alone Block	14.72	2.56	10.00	21.00	**0.00** *
	Bupivacaine Plus Fentanyl Block	17.88	2.00	15.00	25.00	
Duration Of Motor Block (HRS)	Bupivacaine Alone Block	9.66	1.10	8.00	12.00	**0.00** *
	Bupivacaine Plus Fentanyl Block	11.94	1.32	9.00	14.00	
Duration Of Sensory Block (HRS)	Bupivacaine Alone Block	11.69	.97	10.00	13.00	**0.00** *
	Bupivacaine Plus Fentanyl Block	14.00	1.30	12.00	16.00	
Number Of Rescue Doses	Bupivacaine Alone Block	2.00	.76	.00	3.00	0.298
	Bupivacaine Plus Fentanyl Block	1.84	.63	1.00	3.00	

*Statistically significance

The mean onset of analgesia in group I and group II are 17.25 (±1.74) and 18.12 (±1.58) min respectively, and Group I (Bupivacaine) showed early response than group II (Bupivacaine Plus Fentanyl), the difference is marginal but clinically not significant where P showed 0.066. Onset of motor block in minutes and duration of motor block in hours from the dosage given was found to be significance in this study, where p value of mean±SD showed <0.05. We also found a significance with duration (in hours) of sensory block where mean mean±SD of Group II (Bupivacaine Plus Fentanyl Block) was higher than of Group I with p value of 0.00. In both groups equal number rescue medication given for postoperative pain and the mean difference between both groups did not showed any significance. (Table 3).

DISCUSSION:

It has been proven that brachial plexus block is superior to conventional anaesthesia for upper limb surgeries. Presently, ultrasound-guided brachial plexus block is more popular method and can perform rapidly providing a higher success rates [7,8] than the conventional procedures.

At present, in routine clinical practice combination with general anaesthesia to regional anaesthetics are showing promising results with the application of blocks usage, resulting in minimization of analgesics, antiemetic drugs in the post-anaesthesia care period.

In the present study we compared the effectiveness of adding fentanyl to local anaesthetics in supraclavicular brahcial plexus block. In our study, onset and duration of sensory and motor analgesia effects were studied following the administration of 0.5% bupivacaine and 0.5% bupivacaine with 0.0002% fentanyl in adults undergoing upper limb surgeries under supraclavicular block. We found that adding fentanyl to bupivacaine dose showed better results for sensory and motor block offset times. The difference between two groups showed statistical significance (table 3). Previous study by Shiva P.V et al [9] also reported that additionof fentanyl to bupivacaine drug in brachial plexus block showed significant prolonged duration of analgesic effect and delay in the sensory and motor blockade when compared with local anaesthetic bupivacaine dose alone.

In a randomized study by Karakaya D et al., in 2001 [10], the additional efficacy of added fentanyl to bupivacaine had increased the duration of anaesthesia and analgesia in axillary brachial plexus block. Though addition of fentanyl enhances post operative analgesia, the duration of this effect is too brief to be clinically useful which was stated by Kardas K et al [11] and was in congruence with our observation.

We conclude from our findings that addition of Fentanyl to local analgesic adjuvant for supraclavicular brahcial plexus block will provide earlier onset of analgesia and longer duration of postoperative analgesia in upper limb surgeries.

CONCLUSION:

To conclude, the addition of 0.0002% fentanyl to 0.5% bupivacaine for supraclavicular brachial plexus block under ultrasound guidance, resulted in improved intraoperative anaesthesia and postoperative analgesia with minimal difference in hemodynamics but delayed the onset of motor and sensory block.

REFERENCES:

1. Nadeau MJ, Levesque S, Dion N. Ultrasound-guided regional anesthesia for upper limb surgery. Can J Anaesth. 2013;60(3):304320. doi:10.1007/s12630-012-9874-6.
2. Senapathi TGA, Widnyana IMG, Aribawa I, et al. Ultrasoundguided bilateral superficial cervical plexus block is more effective than landmark technique for reducing pain from thyroidectomy. J Pain Res. 2017;10:1619-1622. doi:10.2147/jpr.s138222.
3. Neal MJ, Hebl JR, Gerancher JC, Hogan QH. Brachial Plexus Anesthesia: Essentials of Our Current Understanding. Reg Anesth and Pain Med.2002; 27: 402–428.
4. Covino BG, Wildsmith JAW. Clinical pharmacology of local anesthetic agents. In: Cousins MJ, Bridenbaugh PO, eds. Neural blockade in clinical anesthesia and management of pain. Philadelphia: Lippincott-Raven Publishers; 3rd Ed.1998; 97-128.
5. Karakaya D, Buyukgoz F, Baris S, Guldogus F, Tur A. Addition of fentanyl to bupivacaine prolongs anesthesia and analgesia in axillary brachial plexus block. Reg Anesth Pain Med. 2001;26(5):434-438. doi:10.1053/rapm.2001.24675.
6. Farooq N, Singh RB, Sarkar A, Rasheed MA, Choubey S. To Evaluate the Efficacy of Fentanyl and Dexmedetomidine as Adjuvant to Ropivacaine in Brachial Plexus Block: A Doubleblind, Prospective, Randomized Study. Anesth Essays Res. 2017;11(3):730-73.
7. Dingemans E, Williams SR, Arcand G, et al. Neurostimulation in ultrasound-guided infraclavicular block: a prospective randomized trial. Anesth Analg. 2007;104(5):1275-1280.
8. Brull R, Lupu M, Perlas A, Chan VW, McCartney CJ. Compared with dual nerve stimulation, ultrasound guidance shortens the time for infraclavicular block performance. Can J Anaesth. 2009;56(11):812-818.
9. Shiva PV, Anudeep Kumar T. Comparative study between bupivacaine alone and bupivacaine with fentanyl in axillary plexus block for upper limb surgeries. J. Evid. Based Med. Healthc. 2018; 5(25), 1886-1892.
10. Karakaya D, Büyükgöz F, Bariş S, et al. Addition of fentanyl to bupivacaine prolongs anesthesia and analgesia in axillary brachial plexus block. Reg Anesth Pain Med 2001;26(5):434-438.
11. Kardas K, Schools A, Concepcion M. Effect of brachial plexus fentanyl on supraclavicular block. A randomized, double-blind study. Reg Anaesth 1996;20(4):311-5.