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Comparative Study of Butorphanol Versus Fentanyl With Bupivacaine In Supraclavicular Approach Of Brachial Plexus Block

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Abstract: *Introduction: Narcotic analgesics in spite of their disadvantages, maintain the supremacy in peripheral nerve block. Butorphenol is one of the potent narcotics used by various routes in postoperative period. Supraclavicular approach of brachial plexus block is a very popular technique of anaesthesia for upper limb surgeries. Various opioids have been used as additives to improve and prolong the perioperative analgesia. Fentanyl is commonly added to bupivacaine which results in increased duration of blockade.* ***Materials and Methods:*** *After exclusion criteria and informed consent 90 patients posted for routine or emergency forearm and hand surgeries were included after randomization with coin test. They were divided into 3 groups. Group 1 received 40 ml of 0.25% bupivacaine with 1 ug/kg fentanyl. Group 2 received 40 ml 0.25% bupivacaine with 30ug/kg butorphenol and group 3 received 40 ml of 0.25% bupivacaine with 40 ug/kg butorphenol. Sensory and motor blockade was evaluated. Intraoperative baseline pulse rate, blood pressure, respiratory rate and SPO2 were monitored. Results were analysed using appropriate statistical tests. Complications and side effects were recorded. Conclusion was drawn in terms of effectiveness of the dose of butorphenol.*

Keywords: *Butorphenol*

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I. Introduction

Narcotic analgesics in spite of their disadvantages, maintain their supremacy even today. Butorphanol is one of the potent narcotics used by various routes in postoperative period. Here, we have used perineural route of administration (brachial plexus block) to obtain good pain relief. Supraclavicular approach of brachial plexus block is a very popular technique of anaesthesia for upper limb surgeries.

Various opioids have been used as additives to improve and prolong the perioperative analgesia during this technique. Butorphanol is a kappa receptor agonist and can cause sedation and side effects like other opioids. It had been used via epidural route by Lawhorn et al[1] for paediatric genitourinary procedures . Its use as an additive for supraclavicular block is yet to be evaluated. Fentanyl is commonly added to bupivacaine that results in an increased duration of blockade. Hence in the present study an attempt is made to compare the effects of fentanyl and butorphanol when added to bupivacaine for supraclavicular plexus block.

II. Aims And Objective

To compare butorphanol and fentanyl with bupivaicaine in supraclavicular approach of brachial plexus block in view of :

1) Efficacy - onset of sensory and motor blockade, quality of block.
2) Duration of sensory blockade.
3) Duration of motor blockade.
4) Quality and duration of postoperative analgesia.
5) Safety
6) Side effects if any with local anaesthetic bupivaicaine.

III. Materials And Methods

After ethical committee approval and informed consent, 90 patients posted for routine or emergency forearm and hand surgeries were included in the study randomly.

Selection Of Cases

ASA physical status I or II.
Age between 18 to 50 years of age.

Sex: both males and females
Posted for forearm and hand surgeries.

Exclusion Criterials
The following patients were excluded from the study
Rheumatic heart disease, ischemic heart disease, Hypertension
Respiratory diseases like COPD, Asthma.
Renal and hepatic derangements.
Disease of central nervous system.
Bleeding disorders.
Hypersensitivity/Allergy to any drug.
Patients under the study underwent through pre-operative assessment including detailed case history, physical examination and all necessary baseline investigations like Hb, BT, CT, Urine routine etc.
Written informed consent was taken from all patients.
Intravenous line was secured before the procedure.

Anesthetic Technique
Supraclavicular approach to Brachial plexus (Subclavian perivascular block of Winnie) Position of the patient: Patients were made to lie down supine with the arm adducted. A small pillow was placed under the shoulders and head turned to the opposite side.
Landmarks for insertion of the needle
a) Midway between Sternoclavicular and Acromioclavicular joints.
b) Crossed by line produced downward from the External Jugular vein.
c) Lateral to outer border of Scaleneus Anterior muscle.
d) Just lateral to the pulsating Subclavian artery.
Nerve stimulator set at 1-5 mA attached to the insulating needle and inserted downward, inward and backward at the above landmarks.

IV. Procedure

After painting and draping the site, a skin wheal is raised. The anesthesiologist stands on the side to be blocked, facing the patient. The insulated needle is then introduced in a downward, inward and backward direction. Indication of forearm and hand or visible contraction. Indication of correct placement of needle is either by fascial click, paraesthesia of forearm and hand or visible contraction of the muscles of the upper extremity. The drug was then injected slowly after repeated aspirations.

The patients were randomly assigned to 3 different groups-

- Group 1 n = 30

Received 40 ml of 0.25% bupivacaine with 1mcg/kg fentanyl

- Group 2 n = 30

Received 40 ml of 0.25% bupivacaine with 30 mcg/kg butorphanol.

- Group 3 n = 30

Received 40ml of 0.25% bupivacaine with 40mcg/kg butorphanol.

All local anesthetic solutions and adjuvant drugs were prepared by an anaesthesiologist not involved in the performance of brachial plexus block, patient care and data collection. Sensory blockade of each nerve was assessed by pinprick and compared on the contralateral arm. Sensory blockade was rated on a scale from 100% (normal sensation) to 0% (no sensation).

Motor blockade was evaluated by

- Thumb abduction (radial nerve)
- Thumb adduction (ulnar nerve)
- Thumb apposition (median nerve)
- Flexion of the elbow in supination and pronation of the forearm (musculocutaneous)

Intra operatively baseline pulse rate, blood pressure and respiratory rate and SPO_2 were monitored. For continuous neurological evaluation, no sedative drugs were administered intra operatively. Additionally nausea, vomiting, itching, urinary retention and respiratory depression were recorded.

V. Results

Table 1: Comparison of age between the groups

	Groups	N	Mean	Sd.	ANOVAF	P
Age in yrs.	**Fentanyl 1ugm/kg**	30	36.0	9.384	1.43	P>0.05 NS
	Butorphanol 30ugm/kg	30	39.20	9.148		
	Butophanol 40 ugm/kg	30	39.87	9.723		

TABLE 2: Comparison of sex ratio between the groups

	Males	Females
Fentanyl 1 ugm/kg	18	12
Butorphanol 30 ugm/kg	15	15
Butorphanol 40 ugm/kg	16	14

TABLE 3: Change of pulse from pre-op to 3 hours

	Butorphanol 30 ugm/kg	30	80.27	5.527		
	Butorphanol 40 ugm/kg	30	80.73	5.546		
180 MIN	Fentanyl 1 ugm/kg	30	84.27	3.877	0.246	0.783 NS
	Butorphanol 30 ugm/kg	30	84.67	2.832		
	Butorphanol 40 ugm/kg	30	84.83	2.829		

TABLE 4: Comparison of SBP between the groups at different times

	Preop	5min	10min	30min	60min	120min	180min
Fentanyl 1ugm/kg	119.6	112.27	113.8	113.8	112.53	112.4	117.33
Butorphanol 30ugm/kg	120.13	111.67	113.67	113.6	111.87	111.53	117.13
Butorphanol 40 ugm/kg	120.6	111.87	113.87	113.8	112.07	111.8	117.13

TABLE 5: Comparison of RR between the groups at different times

Groups	N	Mean	RR	Sd.	ANOVA F	P
Fentanyl 1ugm/kg	30	15.40	PREOP	0.855	0.514	0.600 NS
Butorphanol 30ugm/kg	30	15.20		0.761		
Butorphanol 40ugm/kg	30	15.33		0.711		
Fentanyl 1ugm/kg	30	15.27	5 MIN	0.740	0.144	0.866 NS
Butorphanol 30ugm/kg	30	15.20		0.714		
Butorphanol 40ugm/kg	30	15.17		0.747		
Fentanyl 1ugm/kg	30	15.20	10 MIN	0.887	0.104	0.901 NS
Butorphanol 30ugm/kg	30	15.13		0.860		
Butorphanol 40ugm/kg	30	15.10		0.845		
Fentanyl 1ugm/kg	30	15.13	30 MIN	0.819	0.017	0.983 NS
Butorphanol 30ugm/kg		15.10		0.803		
Butorphanol 40ugm/kg		15.13		0.819		
Fentanyl 1ugm/kg	30	15.03	60 MIN	0.809	0.054	0.948 NS
Butorphanol 30ugm/kg	30	15.00		0.788		
Butorphanol 40ugm/kg	30	14.97		0.765		
Fentanyl 1ugm/kg	30	15.03	120 MIN	0.809	0.047	0.954 NS
Butorphanol 30ugm/kg	30	15.10		0.885		
Butorphanol 40ugm/kg	30	15.07		0.828		
Fentanyl 1ugm/kg	30	15.20	180 MIN	0.847	0.223	0.801 NS
Butorphanol 30ugm/kg	30	15.07		0.740		
Butorphanol 40ugm/kg	30	15.13		0.730		

TABLE: 6 Comparison of SpO_2 between the groups at different

	Preop	5 min	10 min	30 min	60 min	120 min	180 min
Fentanyl 1ugm/kg	98.83	98.83	98.7	98.7	98.8	98.8	98.8
Butorphanol 30 ugm/kg	98.83	98.9	98.83	98.83	98.83	98.87	98.9
Butorphanol 40 ugm/kg	96.43	96.4	96.5	96.4	96.47	96.43	96.5

TABLE 7: Comparison of ETCO2 between the groups at different times

	Preop	5 min	10 min	30 min	60 min	120 min	180 min
Fentanyl 1ugm/kg	25.13	25.57	25.37	25.07	25.33	25.2	24.97
Butorphanol 30 ugm/kg	25.2	25.47	25.33	25.03	25.43	25.2	25.03
Butorphanol 40 ugm/kg	25.07	25.13	25.73	26.07	26.1	25.0	24.8

TABLE 8: Comparison of MCPQ between the groups at different times

McPQ	Groups	N	Mean	Sd.	ANOVA F	P
PREOP	Fentanyl 1ugm/kg	30	4.57	0.504	0.576	0.564 NS
	Butorphanol 30ugm/kg	30	4.57	0.504		
	Butorphanol 40ugm/kg	30	4.40	0.968		
5 MIN	Fentanyl 1ugm/kg	30	3.53	1.074	133.67	P<0.001 HS
	Butorphanol 30ugm/kg	30	0.70	0.466		
	Butorphanol 40ugm/kg	30	0.17	0.913		
10 MIN	Fentanyl 1ugm/kg	30	0.57	0.504	15.349	P<0.001 HS
	Butorphanol 30ugm/kg	30	0.30	0.466		
	Butorphanol 40ugm/kg	30	0.000	0.000		
30 MIN	Fentanyl 1ugm/kg	30	0.000	0.000	0.00	
	Butorphanol 30ugm/kg	30	0.000	0.000		
	Butorphanol 40ugm/kg	30	0.000	0.000		
60 MIN	Fentanyl 1ugm/kg	30	0.000	0.000	0.00	
	Butorphanol 30ugm/kg	30	0.000	0.000		
	Butorphanol 40ugm/kg	30	0.000	0.000		
120 MIN	Fentanyl 1ugm/kg	30	0.000	0.000	0.00	
	Butorphanol 30ugm/kg	30	0.000	0.000		
	Butorphanol 40ugm/kg	30	0.000	0.000		
180 MIN	Fentanyl 1ugm/kg	30	0.000	0.000	0.00	
	Butorphanol 30ugm/kg	30	0.000	0.000		
	Butorphanol 40ugm/kg	30	0.000	0.000		

TABLE 9: Ramsay Sedation Score

Level	1-3	Awake
	1	Anxious
	2	Cooperative, oriented, tranquil
	3	Response to commands only
	4-6	Asleep, response to light glabellar tap or loud auditory stimulus
	4	Brisk response
	5	Sluggish response
	6	No response

TABLE 10A: Comparison of sedation between the groups at different times

McPQ	Groups	N	Mean	Sd.	ANOVA F	P
PREOP	Fentanyl 1ugm/kg	30	0.10	0.305	0.179	0.836 NS
	Butorphanol 30ugm/kg	30	0.10	0.305		
	Butorphanol 40ugm/kg	30	0.17	0.747		
5 MIN	Fentanyl 1ugm/kg	30	0.03	0.183	58.749	P<0.001 HS
	Butorphanol 30ugm/kg	30	0.03	0.183		
	Butorphanol 40ugm/kg	30	0.97	0.615		
10 MIN	Fentanyl 1ugm/kg	30	0.30	0.466	50.411	P<0.001 HS
	Butorphanol 30ugm/kg	30	0.33	0.479		
	Butorphanol 40ugm/kg	30	1.63	0.765		
30 MIN	Fentanyl 1ugm/kg	30	0.87	0.346		
	Butorphanol 30ugm/kg	30	0.87	0.346		
	Butorphanol 40ugm/kg	30	1.93	0.740		
60 MIN	Fentanyl 1ugm/kg	30	0.93	0.254	29.485	P<0.001 HS
	Butorphanol 30ugm/kg	30	0.93	0.254		
	Butorphanol 40ugm/kg	30	1.83	0.834		
120 MIN	Fentanyl 1ugm/kg	30	0.63	0.490	27.905	P<0.001 HS
	Butorphanol 30ugm/kg	30	0.63	0.490		
	Butorphanol 40ugm/kg	30	1.60	0.724		
180 MIN	Fentanyl 1ugm/kg	30	0.57	0.504	13.760	P<0.001 HS

	Butorphanol 30ugm/kg	30	0.57	0.504		
	Butorphanol 40ugm/kg	30	1.23	0.679		

Table 10 B: Comparison of sedation between the groups

Groups	Pre op.	60 min	180 min.
I and II	(0,0)	(0.0)	(0,0)
II and III	0.45, 0.65	5,65, < 0.001 HS	4.32, <0.001 HS
I and III	0.45, 0.65	5.65, < 0.001 HS	4.32, < 0.001 HS

Unpaired t test applied p value is significant if $p < 0.05$ and highly significant if $p < 0.001$

TABLE 11: Comparison of the side effects

Group	NIL	NAUSEA	SEDATION
Fentanyl 1ugm/kg	25	5	0
Butorphanol 30ugm/kg	30	0	0
Butorphanol 40ugm/kg	4	0	26

Table 12 : Intra and Post-operative complications

Complications	Fentanyl 1ugm/kg	Butorphanol 30ugm/kg	Butorphanol 40ugm/kg
1) Bradycardia	nil	nil	nil
2) Hypotension	nil	nil	nil
3) Pruritus	nil	nil	nil
4) Respiratory Depression	nil	nil	nil
5) Vomiting	nil	nil	nil
6) Chest wall Rigidity	nil	nil	nil

Table 13 A: Comparison of duration of sensory and motor onset between the groups

	Groups	N	Mean (in seconds)	Sd.	ANOVA F	P
Sensory onset	Fentanyl 1ugm/kg	30	389.13	83.924	163.25	P<0.001 HS
	Butorphanol 30ugm/kg	30	203.77	41.340		
	Butorphanol 40ugm/kg	30	125.87	36.478		
Motor onset	Fentanyl 1ugm/kg	30	761.70	175.428	156.51	P<0.001 HS
	Butorphanol 30ugm/kg	30	415.67	69.546		
	Butorphanol 40ugm/kg	30	262.17	45.139		

Table 13B: Sensory onset comparison between the groups

Groups	**'t' value**	**significance**
I and II	10.85	P < 0.001 HS
I and III	15.76	P < 0.001 HS
II and III	7.74	P < 0.001 HS

Unpaired t test applied p value is significant if $p < 0.05$ and highly significant if $p < 0.001$.

Table 13 C: Motor onset comparison between the groups

Groups	**'t' value**	**significance**
I and II	10.00	P < 0.001 HS
I and III	15.10	P < 0.001 HS
II and III	10.10	P < 0.001 HS

Unpaired t test applied p value is significant if $p < 0.05$ and highly significant if $p < 0.001$.

Table 14 A: Comparison between sensory and motor offset

	Groups	N	Mean (in seconds)	Sd.	ANOVA F	P
Sensory off	Fentanyl 1ugm/kg	30	717.00	117.947	350.38	P<0.001 HS
	Butorphanol 30ugm/kg	30	221.83	33.797		
	Butorphanol 40ugm/kg	30	365.33	40.235		
Motor off	Fentanyl 1ugm/kg	30	500.33	108.611	163.51	P<0.001 HS
	Butorphanol 30ugm/kg	30	220.30	16.282		
	Butorphanol 40ugm/kg	30	269.33	15.742		

Table 14B: Sensory onset comparison between the groups

Groups	't' value	significance
I and II	22.10	P < 0.001 HS
I and III	15.45	P < 0.001 HS
II and III	14.95	P < 0.001 HS

Unpaired t test applied p value is significant if $p < 0.05$ and highly significant if $p < 0.001$.

Table 14C: Comparison of motor duration between the groups

Groups	't' value	significance
I and II	14.00	P < 0.001 HS
I and III	11.50	P < 0.001 HS
II and III	11.80	P < 0.001 HS

Unpaired t test applied p value is significant if $p < 0.05$ and highly significant if $p < 0.001$.

Table 15: Consumption of Analgesics

No analgesic Consumption	Fentanyl 1 ugm/kg	Butorphanol 30 ugm/kg	Butorphanol 40 ugm/kg
1	0	6	18
2	0	22	12
3	0	2	0

VI. Discussion

A supraclavicular approach to the brachial plexus is anesthetically efficient, a small volume of solution can be delivered at a point in which theses trunks are compactly arranged, resulting in rapid onset of blockade of the brachial plexus, to provide excellent anesthesia for upper limb surgeries. It is observed that the onset, quality and duration of sensory and motor blockade is faster in supraclavicular block[2]. Due to its superficial location the approach is technically easy but complications like vascular puncture and pneumothorax are not seen if proper technique and nerve locator is used.

Until now opioids have been used by various routes for relief of postoperative pain. These routes are intravenous, intramuscular, intrathecal, epidural, intra-articular and peripheral nerve block like brachial plexus block. Recently peripheral receptors for various analgesics are found and peripheral administration of the analgesics is gaining more and more importance.

Injection by perineural route is easy to perform and when given in operation theatre with proper precautions, there are less chances of complications. Duration of action is also longer than intramuscular, intravenous and sublingual routes.

In our study we have preferred perineural route (Supraclavicular approach) for comparison between fentanyl and butorphanol. In our study we considered patients undergoing upper limb surgeries like radius plating, ulna plating, radius ulna plating, radius ulna nailing, tendon repair of wrist and hand, below elbow amputation. In our study, the operative time was limited to 60-120.

VII. Selection Of Paitents

All our patients were in the age group 18 to 50 years. The selection of patients according to age and sex was random, provided the patients were ASA grade I or II.

The patients were randomly allocated to three groups only.

Total 90 patients were studied as per table no. 1 & table no. 2.

VIII. Preoperative Cardiovascular Status

Cardio respiratory status in the three groups was comparable. All the patients belonged to ASA Grade I or II. This has excluded any effects on cardio respiratory parameters because of perioperative pathology like in patients with COPD where opioids are contraindicated as there are chances of respiratory depression.

We have studied surgeries lasting for 60-120 minutes and not involving too much volume shifts.

IX. Clinical Assessment Of Pain

UNIDIMENSIONAL SCALE like Visual analogue score or simple verbal rating scale (mild, moderate and severe). In our study sensory blockade was rated on a scale from 100% (normal sensation) to 0% (no sensation). Also MULTIMENSIONAL SCALE which uses Magill's pain questionnaire which is a well established tool which assesses pain under three dimensions i.e. sensory affective and evaluative. This method was used in assessment of postoperative pain.

The mean onset of analgesia in group I was 389.13 seconds.

The mean onset of analgesia in group II was 203.77 seconds.
When group I was compared with group II for onset of sensory analgesia it was found to be clinically and statistically significant. Unpaid 't' test p<0.001 (Table 13B).
When group I was compared with group III it clinically and statistically significant. Unpaired 't' test p < 0.001 (Table 13B).
When group II was compared with group III for onset of sensory analgesia it was found to be clinically and statistically significant. Unpaired 't' test p < 0.001 (Table 13B).
The onset is fastest with group III.
Nishikawa found that the onset time of analgesia was prolonged in every trunk by adding fentanyl to axillary brachial plexus block[3]. He also remarked that pH of lignocaine solution was decreased from 6.2-5.2 by addition of fentanyl. This could have reduced the rate of nerve membrane penetration of lignocaine resulting in slower onset of analgesia. This may have resulted in a delayed onset in our study with bupivacaine.

X. Motor Blockade

The onset of motor blockade in group I was in 761.70 seconds which lasted for duration of 500.33 minutes. The onset of motor blockade in group II was 415.67 seconds which lasted for only 220.30 minutes. The onset of motor blockade in group III was in 269.33 seconds which lasted for duration of 269.33 minutes.
When group I was compared with group II for onset of motor analgesia it was found to be clinically and statistically significant. Unpaired 't' test p < 0.001 (Table 13C).
When group I was compared with group III it clinically and statistically significant. Unpaired 't' test p < 0.001 (Table 13C).
Motor onset was fastest with group III.

XI. Duration Of Analgesia

It is defined as the time interval between local anaesthetic (LA) administration and offset of paraesthesia. The duration of analgesia was calculated in each group.
The mean duration of analgesia in group I was 717.00 mins.
The mean duration of analgesia in group II was 221.83 mins.
The mean duration of analgesia in group III was 365.33 mins.
When group I was compared with group II for the duration of analgesia it was found to be clinically and statistically significant. Unpaired 't' test p < 0.001 (Table 14B).
When group I was compared with group III it clinically and statistically significant. Unpaired 't' test p < 0.001 (Table 14B).
When group II was compared with group III for the duration of analgesia it was found to be clinically and statistically significant. Unpaired 't' test p < 0.001 (Table 14B).
Duration of analgesia was longest with group I.
Karakaya[4] et al, found that addition of fentanyl to bupivacaine for axillary plexus block almost doubled the duration of analgesia.
Nishikawa also found an increase in duration of sensory blockade and analgesia by adding fentanyl to lidocaine[3].
Kapral found a similar increase in duration of motor and sensory blockade by adding tramadol to mepivacaine[5].
Wajima[6]showed that butorphanol infusion into the brachial plexus, when compared with saline decreased pain score.

Thus addition of butorphanol caused a rapid onset of action as compared to fentanyl. However addition of fentanyl produced a longer lasting analgesia. This is in agreement with the Nishikawa's[3] in which onset of analgesia was prolonged in every trunk by adding fentanyl to axillary plexus block.

Advantage of prolonged postoperative analgesia is that steady state of analgesia is beneficial for early healing, psychological well eing and rapid recovery. Need for intermittent injections and waxing and waning analgesic effect is avoided.
No difference in the quality of blockade was recorded between the two groups.

XII. Hemodynamic Changes In The Perioperative And Postoperative Period

The patients were observed for first 24 hours after the injection of these drugs. The preoperative baseline parameters in three groups were comparable.
There was no significant difference in any of the three groups. [Table no 3]
Patients from all the three groups remained hemodynamically stable throughout the surgery without any opioid related side effects at the given dosages of the drug. [Table no 4]
There was minimal decrease in respiratory rate more in group III but is statistically insignificant [Table 5]

There was decrease in the SpO2 of the observed patients in group III (96 - 98%) which was due to sedative effect. But the change in EtCo2 was observed only within first two hours in group III. There was no difference seen in between group I and II. [Table 6] Korhonen AM et al[7] demonstrated that 3 mg of hyperbaric bupivacaine with 10 mcg of fentanyl permits fast-tracking or shorter stay in PACU without any respiratory depression and early discharge with stable vital parameters as in our study, compared with 4mg of hyperbaric bupivacaine. Wajima et al[6] had found in their study that butorphanol causes slight drowsiness but not respiratory depression.

Consumption of Analgesics: Patients were observed for number of analgesics which patients consume in the first 12 hrs post-operatively.f Table 15]

In group I none of the patient required any dose because of the prolonged duration of action of fentanyl.

In group II, 6 (20%) patients required 1 dose of analgesia after 4hrs while maximum 22(74%) patients needed 2 rescue analgesic dose and 2(6%) needed 3 doses of analgesic doses.

In group III, 18(60%) needed only 1 dose and 12(40%) needed 2 doses of rescue analgesia after 7 hrs. Thus for post-operative analgesia fentanyl is superior to butorphanol.

When patients complain of discomforting pain, intramuscular inj. Diclofenac 75 mg was given and time noted.

XIII. Sedation Score

Ramsay sedation score was applied for assessment of sedation (Table 9). Patient in group I and II were all awake throughout intra and post operative period. Group III Patients' sedation scores were statistically significant, but they were arousable and maintaining O2 saturation with venti mask (Table 10 B).

XIV. Complications

Few patient in group I had nausea but sedation was significant in group III. Group II was free from all complications. (Table 11 & 12). There were no significant differences in the incidence of nausea, vomiting, hypotension and urinary retention. No patient developed respiratory depression. There was no incidence of any complication in the study done by Wajima[6] et al with butorphanol which correlates with our study.

XV. Conclusion

Perineural injection of butorphanol with bupivacaine can provide early onset of sensory and motor blockade. There is hardly any difference in between the onset of action between the doses 30mcg/kg and 40mcg/kg of butorphanol but sedation is an unavoidable side effect with 40 mcg/kg.

Fentanyl enhances the duration of postoperative analgesia The only demerit is late onset of action as compared to butorphanol.

The above advantages can be obtained without any side effects.

The upper limb surgeries of long duration can be done under supraclavicular block by using fentanyl and bupivacaine combination where very fast onset of action is not needed. The upper limb surgeries of short duration can be done under supraclavicular block by using butorphanol and bupivacaine combination.

Sedation is the only and main side effect and the limiting factor with 40mcg/kg butorphanol with its peak effect at 1 hour, however sedation wears off at the end of the surgery and patients are arousable .But oxygen supplementation with monitoring of saturation is needed in post anaesthesia care unit.

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