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# COMPARISON OF FENTANYL AND DEXMEDETOMIDINE AS ADJUVANT TO BUPIVACAINE IN PERIPHERAL NERVE STIMULATOR GUIDED AXILLARY BRACHIAL PLEXUS BLOCK – A PROSPECTIVE RANDOMISED DOUBLE BLIND STUDY.

Anaesthesiology

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## ABSTRACT

**Background:** Axillary Brachial Plexus Block has gained popularity in forearm surgeries. Addition of adjuvants to local anaesthetics can prolong post-operative analgesia. But there are very few studies comparing Fentanyl and Dexmedetomidine as adjuvants to Bupivacaine in axillary block. Hence we carried out comparative evaluation of two drugs as adjuvants among patients undergoing forearm orthopaedic surgeries. **Methods:** This prospective randomized double blind study included eighty patients of either gender aged 18 to 60 years, ASA-I/II, scheduled for forearm surgeries divided into two groups of 40 patients each using opaque sealed enveloped technique . BF group: 24 ml volume of 0.25%Bupivacaine+ Fentanyl 1mcg/kg. BD group: 24 ml volume of 0.25%Bupivacaine+ Dexmedetomidine 1mcg/kg. Patients were observed for onset, peak effect, duration of post operative analgesia and perioperative complication, if any. **Results:** Mean duration of post operative analgesia was significantly prolonged in BD group compared to BF group (1000.77±37.71 vs 795.62±45.69 minutes), ($p<0.0001$). While onset and effect of complete block was achieved earlier in BF group. Grade 1 post operative sedation score was seen in 10% cases of BD group. There was no significant haemodynamic disturbances perioperatively. **Conclusion:** Dexmedetomidine as adjuvant to Bupivacaine in Axillary brachial plexus block for orthopaedic forearm surgeries produced prolonged duration of post-operative analgesia compared to Fentanyl adjuvant without significant adverse effect.

## KEYWORDS

Axillary Brachial plexus block, Bupivacaine0.25%, Dexmedetomidine, Fentanyl

## 1. INTRODUCTION

Peripheral nerve block has become widely accepted reliable alternative technique to general anaesthesia due to many advantages. *Peripheral nerve blocks not only provide intraoperative Anaesthesia but also postoperative analgesia without any systemic side effects [1].* Regional techniques provide superior analgesia, compared to systemic medications, providing early rehabilitation as well. Most of the orthopaedic surgeries cause patients to experience significant perioperative pain. If adequate analgesia is not provided the pain may hinder early physiotherapy and rehabilitation and prolongs the hospital stay. *For the upper limb orthopaedic surgeries, brachial plexus block has evolved to be excellent substitute[2].*There are several approaches to brachial plexus block i.e interscalene, supraclavicular, infraclavicular, and axillary. Among them, *Axillary brachial plexus block is most widely practised as it is a simple method of anaesthetizing the upper limb, best blockade rate in the distribution of C7-T1[3].* It is simple to perform, has *easy landmarks, carries no risk of pneumothorax and horner's syndrome,[4]* as seen with blockade at higher level. Several techniques of localizing plexus at this level are: Landmark technique with paraesthesia, Peripheral nerve stimulator (PNS) guided, trans arterial technique, USG guided technique. Historically, block techniques evolved through double or multiple axillary injections in the neurovascular sheath. However, the development of Peripheral Nerve Stimulators and insulated atraumatic needles has allowed electrolocation and separate block (multi stimulation technique) of the individual terminal nerves (median, musculocutaneous, ulnar, and radial). This is known as the multiple-nerve stimulation technique. Peripheral nerve stimulator and USG guided techniques are more precise, safe and commonly used. *Axillary block using nerve stimulation (peripheral nerve stimulator) has become the gold standard technique to locate the nerves for either single 2 or multiple injection and is proved to provide effective anaesthesia[5].* Inspite of increasing popularity of USG guided blocks, many people prefer *Peripheral Nerve stimulator technique because it is handy and simple to use; cost effective, user friendly ,and gives targeted nerve localization[6].*Although USG guided block has several advantages, but it is a complex machine which is costly and requires technical expertise. It may not be available all the time. *Landmark guided paraesthesia technique has its own drawback like accidental intravascular injection, and high failure rate or partial block[7].* In our study, we chose PNS guided technique. Since long, various ADJUVANTS have been added to local anaesthetics to improve quality of peripheral nerve blocks as well prolong the duration of post operative analgesia. *There has always been a continuous search for adjuvant in regional nerve block using the drugs that prolong the duration of analgesia but with lesser adverse effects.[1]* Clonidine was the first α-2 agonist to be used as an adjuvant initially for intrathecal and epidural route and later on also in peripheral nerve blocks along with local anaesthetics. Dexmedetomidine , a newer alpha 2 agonist is now gaining popularity as adjuvant because of its lesser side effects and titratable dose as compared to clonidine. Among opioids, Fentanyl is known widely as an adjuvant to local anaesthetics in peripheral nerve blocks. Many studies are available for supraclavicular Brachial plexus block, comparing dexmedetomidine and fentanyl added to Ropivacaine or Bupivacaine. But there are limited studies comparing these adjuvants in axillary brachial plexus block. There are in fact no direct study available comparing fentanyl and dexmedetomidine as adjuvants to bupivacaine in PNS guided axillary brachial plexus block. This inspired us to compare the most studied opioid - Fentanyl with the novel alpha 2 agonist Dexmedetomidine as an adjuvant to Bupivacaine in Peripheral nerve stimulator guided Axillary Brachial Plexus block.

**Primary objective:**

Duration of Post operative analgesia defined as "Time from drug administered to first dose rescue analgesia" which was assessed with Visual analogue Scale Score.

**Secondary objectives:**

Onset and Duration of Sensory Block (assessed by pin prick with blunt needle),Onset and Duration of Motor Block (assessed by modified Bromage Scale),Time taken to achieve Complete Block,Sedation Score,Perioperative Complications, if any.

## 2. METHODOLOGY

This prospective, randomized, double blind study was carried out after taking permission from Institutional ethics committee for biomedical and Health research (IECBHR/14-2022), in the Department of Anesthesiology, Baroda Medical College and S.S.G Hospital, Vadodara, between the periods of April, 2022 to October,2022. CTRI Registration No: CTRI/2022/03/0408111)

**Inclusion Criteria:**

- Age Group: 18-60 years of either gender.
- Patients weights: 50 to 70 kg

- ASA: I/II
- Patients posted for elective unilateral forearm surgeries in orthopaedic department of SSG Hospital.
- Patient able to give written & informed consent.
- Patient able to understand Visual Analogue Scale.

**Exclusion Criteria:**
- Patient not willing for procedure.
- Hypersensitivity to study drugs.
- Patients with coagulopathy.
- Local infection at the injection site or local anatomical deformity.
- Patient with polytrauma / associated nerve injury/ Haemo dynamically unstable patients.
- Pre- existing neuropathy, H/O seizures, Hypertension, Diabetes, any other metabolic disorders, cardiac, respiratory, hepatic or any other diseases, psychiatric illness.
- Patients with significant h/o drug or alcohol abuse. .
- Patient with history of taking α 2 adrenergic drug , any form of opioids.
- Pregnant and lactating mothers.

**Sample Size:**
Sample size estimation was done following pilot study of 5 patients in each group. Our Primary Aim "Mean duration of analgesia 714.2 minutes in Group BF vs 966.4 minutes in Group BD" was taken as main parameter. Taking mean difference of the two mean readings 252.2 minutes with standard deviation (SD) 22.10 minutes (Group BF) and 16.94 minutes (Group BD) at 95% confidence and 80% power, Sample size estimated was1 patient in each group (Total 2 patients) using Open Epi software. This was very small and not justified for the study, So we took sample size of 40 per group as per statistician advice. The patients were randomly allocated into two groups of 40 each by opaque sealed envelope method.

**Group BF** (Bupivacaine+ Fentanyl) (n=40):
12 ml of 0.5% inj. Bupivacaine with inj. fentanyl 1mcg/kg diluted with sterile water to make total 24 ml drug volume.

**Group BD** (Bupivacaine+ Dexmedetomidine) (n=40):
12 ml of 0.5% inj. Bupivacaine with inj. Dexmedetomidine 1mcg/kg with sterile water to make total 24 ml drug volume.

Patients were visited a day before surgery for pre-anaesthetic checkup and preoperative advice.

Informed and written consent was obtained from all patients enrolled in study and was kept nil orally for 6 to 8 hours.

On the day of surgery , patients were re-evaluated and monitored for baseline parameters (pulse rate [PR], Systolic blood pressure[SBP], Diastolic blood pressure[DBP], Electrocardiogram[ECG], Oxygen saturation[SpO2]). A good venous access was secured on non operative limb and inj. Ringer lactate was started. Patient premedicated with Inj. Ondansetron 8mg IV, Inj. Midazolam 1mg IV with supplemental oxygen given via facemask Patient were placed in supine position on Operation table with ipsilateral arm abducted to approximately 90 degree and the elbow flexed with the hand resting on a pillow next to the head. Head turned to opposite side.

Nerve location was performed with a Peripheral Nerve Stimulator (PLEXYGON 7501.31) using 22 gauge, 5 cm long, short bevelled, Teflon coated insulating needle (STIMUPLEX A)., under all aseptic precautions the Axillary Artery was marked at its highest point in axilla. Median and Musculocutaneous nerves were blocked through single puncture above the artery; Radial and Ulnar nerve were blocked through single puncture made below the artery.

After negative aspiration of blood, the initial injection of 1 ml prepared drug solution, the contractions started to fade. 6 ml drug solution was injected in each nerve

**Evaluation of block:**
The point at which the injection of prepared drug solution was completed was considered as *Zero minute* and the duration of each parameter was measured from this point.

**Sensory Block:**
Sensory effect was checked by pin prick (24G blunt Needle), after every 2 minutes till 30 minutes or till the required effect was achieved , whichever was early.
Grade 0 = Sharp sensation to pin prick (no effect)
Grade 1 = Dull sensation to pin prick
Grade 2 = No sensation to pin prick ( complete effect)

Assessment was done along the distribution of Median nerve, Musculocutaneous nerve, Radial nerve, Ulnar nerve along forearm as follows:
- Musculocutaneous nerve – Lateral aspect of forearm
- Median nerve – Volar aspect of thumb
- Radial nerve – Lateral aspect of dorsum of hand
- Ulnar nerve – Volar aspect of fifth finger

**Onset time:**
Time after drug injection to achieve grade 1 from grade 0 was considered as Onset time.

**Time to achieve complete Sensory block:**
Time after drug injection to complete loss of pinprick sensation ( grade 2 from grade 0) was considered as time required for complete sensory block.

**Duration of Sensory Block:**
Time from achieving grade 2 till return of grade 0.

**Motor Block:**
Motor effect was checked by Modified Bromage scale(4 POINT SCALE) after 2 minutes till the required effect was achieved , maximum up till 30 minutes.

**Table 1: Modified Bromage Scale**

| | |
|---|---|
| Modified Bromage Scale 0 | Full muscle strength in relevant groups(No effect of block) |
| Modified Bromage Scale 1 | Ability to move against gravity, but not against resistance |
| Modified Bromage Scale 2 | Discrete movements of muscle groups |
| Modified Bromage Scale 3 | Lack of movement(Complete block) |

Assessment was done along the distribution of musculocutaneous nerve, median nerve, radial nerve and ulnar nerve as follows:
- Musculocutaneous nerve - Elbow flexion
- Median nerve – Thumb opposition
- Radial nerve – Thumb abduction
- Ulnar nerve – Thumb adduction

**Onset time:**
Time after drug injection to achieve Modified Bromage Scale Grade 1 from Grade 0 was considered as Onset time.

**Time to achieve complete Motor block:**
Time after drug injection to complete block ( Modified Bromage Scale Grade 3 from 0) was considered as time required for complete Motor block.

**Duration of Motor Block:**
Time after achieving Modified Bromage Scale grade 3 till regression to grade 0.

**Assessment of Block success**
**Complete block:**
If sensory and motor block was achieved in all the dermatomes supplied by the radial, ulnar, median, musculocutaneous nerves.

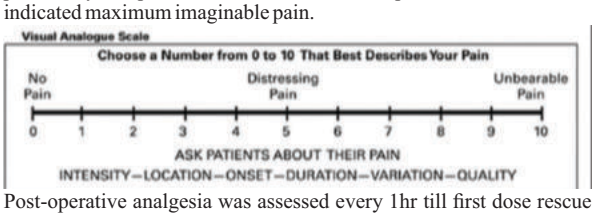
**Incomplete block:**
If any one of these dermatomes ( single nerve sparing) fail to show sign of sensory or motor block after 30 minutes of prepared drug injection. Then proportion of block was supplemented at the elbow (0.25% Bupivacaine); or intravenous sedation with Inj. Ketamine 1-1.5mg/kg .

**Failed Block:**
If two or more than two nerves remained spared, then the block was considered as failed block and standard general anaesthesia was administered.
**Failed block were excluded from the study.

**Post Operative Sedation:**
After completion of orthopaedic procedure, before shifting; the patient

were assessed for sedation as follows:
0 Awake and Alert
1 Awake but tranquil, respond to verbal commands
2 Asleep responds to loud verbal commands/ painful stimuli

**Post – Operative Evaluation of Block (Duration of analgesia-Primary Objective):**
Pain was assessed using 10-point Visual Analogue Scale – **VAS.** Patients were explained about the scoring system again post operatively and were asked to mark a vertical mark on the following scale (VAS) which reflected the intensity of pain as per numerical score pointed by the patient. Point 0 indicated no pain whereas Point 10 indicated maximum imaginable pain.




Post-operative analgesia was assessed every 1hr till first dose rescue analgesia with inj. Paracetamol 1gm given at VAS Score of 4 or more .

**Duration of analgesia:**
Time interval from end of injection of study drug solution to first rescue analgesic drug required.

Patient were watched for vital parameters (Pulse Rate, Blood Pressure, SpO2) and any complications perioperatively. If pulse rate dropped below 60 bpm , was treated with injection atropine 0.02mg/kg iv, and systolic blood pressure [SBP< 90 mmHg] was treated with iv fluids and with injection mephentermine 5mg/ml, nausea and vomiting treated with injection ondansetron 4mg iv.

**Statistical analysis:**
**Statistical analysis** for the various parameters were done using **MedCalc** Software version 19.5.1. Unpaired students t test for Quantitative data like Age, Onset , Complete effect , Duration of block; VAS score, Intergroup hemodynamic parameter represented as mean and standard deviation. Paired students t test for intragroup hemodynamics.Chi square test for Qualitative data like Gender, ASA grading, sedation score which was represented as percentages and ratios.

## 3. RESULTS
The present study was carried out with the aim to compare the efficacy of Fentanyl and Dexmedetomidine as adjuvants to bupivacaine in peripheral nerve stimulator guided axillary brachial plexus block among patients undergoing orthopaedic forearm surgeries.

**Table 2 : Demoghaphic Data**

| Parameter | Group BF (Mean±SD) | Group BD (Mean±SD) | p value |
|---|---|---|---|
| Age in Years | 40.8±16.21 | 44.1±14.11 | 0.39 |
| Gender (Male: Female) | 30:10 | 20:20 | 0.87 |
| Weight in Kg | 61.05±6.47 | 58.9±7.35 | 0.429 |
| ASA (I:II) | 15:25 | 25:15 | 0.71 |

SD: Standard deviation, ASA: American Society of Anaesthesiologist
Table 2 compares bas eline demographic characteristics between the two groups.

**Table 3: Assessment Of Sensory Block**

| Parameter | Group BF (Mean±SD) | Group BD (Mean±SD) | P value |
|---|---|---|---|
| Onset time(minutes) | 3.75±0.74 | 4.87±0.79 | p<0.001 |
| Time to achieve complete block(minutes) | 14.45±2.19 | 22±1.61 | p<0.001 |
| Duration of sensory block (minutes) | 758.9±49.92 | 961.35±34.85 | p<0.001 |

**Table 4: Assessment Of Motor Block**

| Parameter | Group BF (Mean±SD) | Group BD (Mean±SD) | P value |
|---|---|---|---|
| Onset time(minutes) | 5.65±0.080 | 6.375±0.86 | p<0.001 |
| Time to achieve complete block(minutes) | 21.2±3.28 | 28.9±3.58 | p<0.001 |
| Duration of motor block (minutes) | 671.225±53.21 | 863.175±41.02 | p<0.001 |

**Table 5: Assessment Of Post-operative Sedation**

| Sedation Score | Group BF( no. of patients) | Group BD (no. of patients) |
|---|---|---|
| Score 0 | 40 | 36 |
| Score 1 | 00 | 04 |
| Score 2 | 00 | 00 |

Table 5 depicts degree of sedation in both groups. In Group BD out of 40 patients, 4 patients developed Score 1 sedation while no patients had sedation in Group BF

**Table 6: Assessment Of Post-operative Analgesia (time Of Vas Score>4)**

| Parameter | Group BF (Mean±SD) | Group BD (Mean±SD) | p value |
|---|---|---|---|
| Duration of post-operative analgesia | 795.625±45.69 | 1000.775±37.715 | p<0.001 |

VAS Score of >4 was considered as Duration of postoperative analgesia

**Perioperative Haemodynamics**

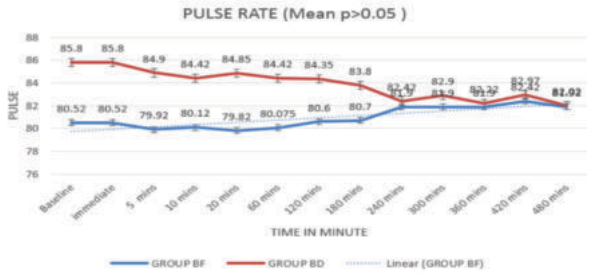



**Figure 1: Perioperative Change In Pulse Rate**

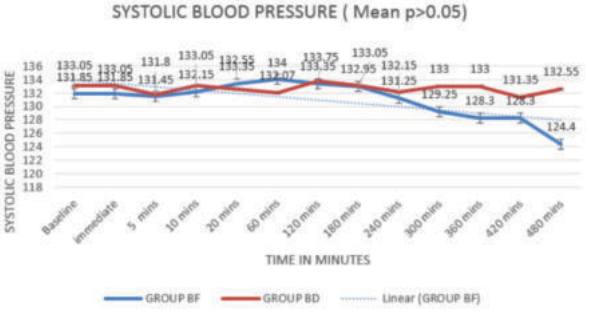



**Figure 2: Perioperative Change In Systolic Blood Pressure**

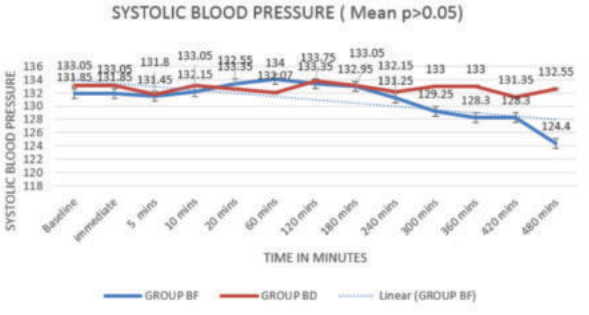



**Figure 3: Perioperative Change In Diastolic Blood Pressure**

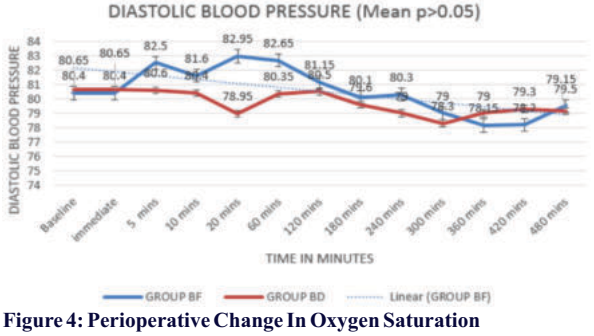
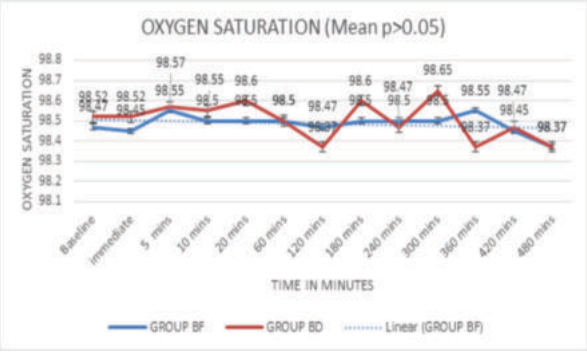



**Figure 4: Perioperative Change In Oxygen Saturation**




## 4. DISCUSSION

Pain alleviation is an indispensable element for post-operative period. Terror of pain increases apprehension and stress response resulting delayed recovery and rehabilitation. This present study was carried out as a prospective, randomized, double blind study to evaluate the effect of Fentanyl and Dexmedetomidine as adjuvant to bupivacaine, in terms of onset, time to achieve complete block, duration of block , duration of post-operative analgesia and various side effects i.e : hypotension, Bradycardia, nausea, vomiting. Both the group were matched for for age, gender, weight, ASA grading(Table 2)

**Sensory block:**

**Onset of sensory block**:

In **Our Study** we found that the mean time for onset of sensory block was 3.75±0.74 minutes in Group BF and 4.87±0.79 minutes in Group BD.

The difference between the mean was highly significant statistically.($p<0.001$) which showed Fentanyl to give faster onset when added to Bupivacaine in our study.

**Our findings** are in consonance with **Nyla Farooq et al,2017** who also observed faster onset with Fentanyl Group (9±1.8 minutes) than Dexmedetomidine Group (11.9±2.6 minutes)

Gupta et al ,2021 study showed that the onset of sensory block 7.2±5.4 mins in Fentanyl group and 6±1.8 mins in Dexmedetomidine Group; But it was statistically insignificant between the groups ($p>0.05$)

On the other hand,Hamed MA et al,2018 found statistical difference between the group in terms onset of sensory effect which is contradictory to our study that Dexmedetomidine (5.75±2.2 mins) achieved early block onset as compared to fentanyl (11.8±3.4 mins) group.

**Time to achieve complete sensory block:**

In Our study we found that the mean time to achieve complete sensory block was 14.45±2.19 minutes in Group BF and 22.0±1.61 minutes in Group BD.

The difference between the mean times were highly significant statistically ($p<0.001$). Our study shows that Fentanyl achieved early complete sensory block than Dexmedetomidine when added to Bupivacaine.

We could not find any study comparing time to achieve complete block as parameter, till date. Although, Gupta et al, 2021 compared the maximum grade of sensory block achieved between the two groups which they found to be statistically insignificant.($p>0.05$)

In our study we found that the mean time of duration of sensory block was 758.9±49.92 minutes in Group BF and 961.35±34.85 minutes in Group BD. The difference between the mean times were highly significant statistically. ($p<0.001$).

Our study showed that Dexmedetomidine when added to Bupivacaine proved to be better than Fentanyl in prolonging duration of sensory block.

Our findings are similar to Gupta et al, 2021 who also observed that duration of sensory block was prolonged in Dexmedetomidine Group (235.8±57 minutes) than in Fentanyl Group (210±40.2 minutes)

On the other hand, Study by Nyla Farooq et al,2017 showed Fentanyl having prolonged duration of block (425.7±42.4 mins) than Dexmedetomidine (378.3±59.6 mins) when added to ropivacaine.

**Motor Block:**

**Onset of motor block:**

In Our study we found that the mean time for onset of motor block was 5.65±0.08 minutes in Group BF and 6.37±0.86 minutes in Group BD. The difference between the mean times were highly significant statistically. ($p<0.001$)Fentanyl group showing earlier onset of motor block than Dexmedetomidine group in our study.

Our findings are in correspondence with Nyla Farooq,2017 who also found faster onset of motor block in Group Fentanyl (14.1±3.5 minutes) than in Dexmedetomidine Group (23.1±3.9 minutes) .

Gupta et al ,2021 study noted that the onset of motor block was 14.64±10.26 mins in Fentanyl group and 14.22±8.94 mins in Dexmedetomidine Group; But the difference was statistically insignificant. ($p>0.05$)

Hamed MA et al,2018 remarked significant difference between the two groups in terms of onset of motor block that Dexmedetomidine (6.85±2.4 mins) achieving early block onset as compared to fentanyl (13.7±3.3 mins) group which is contradictory to our study.

**Time to achieve complete motor block:**

In our study we found the mean time to achieve complete motor block was 21.2±3.28 minutes in Group BF and 28.9±3.58 minutes in Group BD ($p<0.001$)

Thus, Fentanyl group showed to achieve complete motor block faster than Dexmedetomidine group which was statistically significant.

We could not find any study comparing time to achieve complete block as parameter, till date.

But Gupta et al, 2021 compared the maximum grade of motor block achieved between the two groups which they found to be statistically insignificant.($p>0.05$)

**Duration of motor block:**

In our study we found that the mean time of duration of motor block was 671.22±53.21 minutes in Group BF and 863.17±41.02 minutes in Group BD. The difference between the mean times were highly significant statistically. ($p<0.001$)

The study by Gupta et al, 2021 showed that the mean time of duration of motor block was prolonged in Dexmedetomidine Group (279±63.6 minutes) then in Fentanyl Group (232.57±57 minutes) , the findings of which are similar to our study.

With respect to duration of motor block, Nyla Farooq, 2017 observed opposite result of Fentanyl having prolonged duration of block (369.4±36.8 mins) than Dexmedetomidine (323.7±48.1 mins) when added to ropivacaine.

**Post operative sedation:**

In our study we found that the postoperative sedation score of 1(awake but tranquil) was present in 4 cases of Group BD while no sedation in Group BF.

Our findings are in consonance with Gupta et al ,2021 with postoperative sedation of Grade 3 in 4 patients of Dexmedetomidine Group where as Fentanyl Group showed no sedation.

**Postoperative Analgesia :**

In our study the mean duration of postoperative analgesia was 795.62±45.69 minutes in Group BF and 1000.77± 37.71 minutes in Group BD. The difference between the mean duration were highly significant statistically.

Our findings are in support with Gupta et al, 2021 who also commented that the mean duration of analgesia was higher in Dexmedetomidine group (356.13±19.66 mins) as compared to Fentanyl group (301.75±14.87 mins).

**Perioperative hemodynamics:**

Statistically, no significant differences were observed among the

groups at any time interval in mean hemodynamic parameters (p>0.05). And also Between – group comparison did not reveal a statistically significant difference for any of the comparisons(p>0.05)

Dexmedetomidine and Fentanyl being adjuvants when added to Bupivacaine local anesthetic, the mechanism of the analgesic effect is still not clear and might be multifactorial. According to various studies:

Yoshitomi et al explained that Dexmedetomidine induces vasoconstriction through an action on alpha 2 adrenergic receptors or it acts by peripherally reducing norepinephrine release and increasing the potassium conduction in C and A delta fibers , which are responsible for passage of pain stimulus.Gupta et al stated that Dexmedetomidine activates inwardly rectifies G1 protein gated potassium channels, resulting in membrane hyperpolarization thus, decreasing the excitability of the cells.
Gupta et al also stated that Fentanyl acts on Peripheral Nervous System. He further stated that existence of endogenous and exogenous opioid receptor in Peripheral Nervous System and initiation of anti nociceptive action by the activation of such receptors provides extended analgesic action.

Rajkhowa et al stated in their study that Fentanyl prolongs analgesia due to existence of peripherally functioning opioid receptors.

Moreover some studies supports the Fentanyl providing better and prolonged analgesia than Dexmedetomidine when added as adjuvant which as supported by Nyla Farooq showing mean duration of analgesia by Fentanyl (7.54±0.51hrs) which is more than Dexmedetomidine (5.43±0.78 mins) and the difference was statistically significant.(p<0.001)

However, contradiction among various studies as compared to our study might be due to various factors like selection of patients, type of surgeries, approach to brachial plexus, type and concentration of local anesthetic used, dose of adjuvants, duration of surgeries, even the sample size.

**Limitations Of Our Study**

- In our study we evaluated pain by VAS score as interpreted by patients .So it becomes subjective and might vary from patient to patient with their understanding and pain tolerance. Scoring system could be better supplemented with objective Scoring systems like Wong Baker pain scale.
- VAS Score at regular time interval indicates the quality of pain. We did not compare VAS Score between the groups at particular point of time, hence unable to comment on quality of pain relief by adjuvants.
- In our study we did not compare with control group without adjuvants . Hence, we were unable to compare with the baseline effect of block with local anesthetics only group.
- We used Peripheral nerve stimulator guided axillary block, where as adding USG with PNS could have improved our results.

**Future Scope:**

- Dexmedetomidine can replace opioid as adjuvant to local anaesthetics as it can have better results for postoperative analgesia without causing much side effects.

## 5. CONCLUSION

Addition of dexmedetomidine was found to be better in prolonging the duration of post operative analgesia in orthopedic forearm surgeries done under axillary block without significant adverse effect than addition of fentanyl. Although onset and peak of sensory and motor block which was our secondary Objective was achieved earlier with Fentanyl than Dexmedetomidine. Thus concluding, Dexme detomidine when added in dose of 1mcg/kg to 0.25% Bupivacaine gives significantly prolong duration of analgesia than when Fentanyl was added in dose of 1mcg/kg. Empirical applicability of results obtained in our study needs to be validated. Hence, further studies are recommended to highlight the difference between the two adjuvants.

**6. Financial Support And Sponsorship**
None.

**7. Conflicts Of Interest**
None.

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