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# Dexamethasone Versus Dexamedetomidine as adjuvants to Bupivacaine ultrasound guided supraclavicular brachial plexus block in upper limb surgery

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**ABSTRACT**

**Background:** Brachial plexus blocks (BPB) are broadly utilized for anesthesia & managing postoperative pain for upper limb operation.

**Objective:** the research purposed to evaluate the Dexamethasone &Dexmedetomidine efficacy as adjuncts for Bupivacaine ultrasound-guided supraclavicular BPB in upper extremity surgery.

**Methods:** Sixty cases participated in this prospective randomized controlled research (ASA)I ll, schedule for elective upper extremity operations that involve supraclavicular BPB. Separated into 3 groups, injection of Bupivacaine twenty ml 0.5% group (B), addition of dexamethasone 1ml (4 mg) with Bupivacaine 0.5% in group (x) and Dexmedetomidine 1 ml (100 mic) with Bupivacaine 0.5% in group (D). Pain assessment was primary outcome and secondary outcome included the first request analgesia, total dose and hemodynamics were monitored.

**Results:** Dexmedetomidine has rapid onset, long duration than dexamethasone .1st request analgesia was delayed in dexmedetomidine than dexamethasone and control group. total analgesic dose was higher on control group, dexamethasone group and was lowest on dexmedetomidine group. Dexmedetomidine has lowest VAS score

**Conclusion:** Dexmedetomidine is greater efficient than dexamethasone as an adjunct to Bupivacaine in ultrasound-guided BPB. Dexmedetomidine extends sensory &motor block period &affords a more rapid onset. Dexmedetomidine additionally offers an extended period of analgesia than dexamethasone.

**Keywords:** Brachial plexus blocks, anaesthesia, upper limb surgery, Dexamethasone, Dexamedetomidine.

## INTRODUCTION

Ultrasound (US) has become an important tool of nerves blocks in recent years. The detection of vascular structures &other aberrations in the needle's path is a significant benefit of the usage of ultrasound guidance in nerve blocks. This enables avoiding of these structures, so reducing complication rate ***[1].***

The supraclavicular approach to brachial pluxus block usually involves anesthesia of the upper limb, involving the shoulder, as all trunks &divisions may be anaesthetized from this location. Consequently, the supraclavicular block is frequently mentioned to as the "spinal of the arm' ***[2]***.

Bupivacaine is one of most common medication for bracial plexus block. It is a member of the homologous series of N-alkyl substituted pipecholyxylides. It is regarded as the first local anesthetic that has the characteristics of a profound sensory &motor blockade, an extended period of action, &an acceptable onset ***[3].***

Various drugs are utilized in conjunction with local anesthetics to decrease the time to onset of impact, extend the period of action, &raise the probability of successful blockade.

In addition, human researches have documented the analgesic impacts of systemic &spinal corticosteroids combined with LAs. In human &animal studies, the period of the block was prolonged by dexamethasone microspheres ***[4].*** Additionally, dexamethasone has been demonstrated to have an anti-inflammatory effect

Dexmedetomidine is a potent, greatly selective, &specific α2-adrenergic agonist that exhibits analgesic, sedative, &antihypertensive effect. The surgical cases may also benefit from the addition of dexmedetomidine to local anaesthetics through peripheral nerve blockade &regional aesthesia methods ***[5]***.

## AIM OF THE WORK

The research objected to compare Dexamethasone impact (4mg within 1mL volume) &Dexmedetomidine (100mcg in 1mL volume) when combined with Bupivacaine (20 ml 0.5%) on the duration &onset of supraclavicular BPB in cases having upper extremity surgeries.

## PATIENTS & METHODS

This prospective randomized controlled research comprised sixty cases who underwent a surgical procedure on the upper extremity as part of the standard antiesthetic methods After approval by committee of Al-Zahraa hospital, Al-Azhar university and written, informed consent, time of duration

In this comparative randomized prospective clinical research, cases of both genders age 21-60 that were scheduled for unilateral upper extremity operations beneath the shoulder under supraclavicular BPB &had an ASA physical status I &II were enrolled. cases that rejected to participate in the study, as well as those having peripheral neuropathy of the upper extremity, diabetes, altered mental status, injection site infection, or a history of allergy to local anesthetics, were excluded. We also excluded cases who were scheduled to receive general anesthesia for the same operation due to coagulopathy, bone grafts, skin grafts, or the primary operation site being the medial side of the arm at the axilla level (T2 distribution).

Cases have been divided randomly into 3 identical groups, (twenty cases within every group): Group X: Dexamethasone group added to bupivacaine where Patient was given 20ml bupivacine + (4mg of dexamethasone). Group D: Dexmedetomidine group added to bupivacaine. Where the Patient was given 20ml bupivacine + (100mcg in 1ml volume) dexamedetomidine. Group B: Bupivacaine as a control group. Where the Patient was given 20ml bupivacaine.

**Equipment & material utilized:** Ultrasound machine (figure 1a) (sonosite, M turbo) linear probe (figure 1b).

**a)**  **b)** 

**Figure (1): a)** Ultrasound machine. **b)** Linear probe

**Preoperative evaluation:** All cases have been examined prior to operation to determine their medical history, including any drug intake or medical conditions. Subsequently, the patient's antiesthetic choices were discussed. Systemic evaluations, general assessments, &airway assessments were conducted. prior to the operation, a minimum of six hours of preoperative fasting was maintained. The patient was properly informed of the risks &benefits. Explaining VAS to the patient

**Technique:** In the pre medication room, 18-gauge intravenous cannula (IV) in the non-operated arm was implanted. All cases have been premedicated with 0.02 milligram per kilogram IV midazolam. & on arrival to the operating theater, 500 ml Ringer solution was infused intravenously over 30 minutes.

**Monitoring:** cases were monitored utilizing a five-lead Electrocardiography (ECG), pulse oximeter & noninvasive blood pressure was recorded. The supraclavicular BPB was achieved with the case in the supine position, 45° table head up, and with the head switched toward the nonoperative side. The lateral aspect of the neck was sterilized with iodine 10% and draped. A linear array ultrasound transducer (sonosite, M turbo, Germany) was used in the study.

A sterile cover was used over the transducer along with a sterile gel. To visualize the plexus, the probe has been positioned in the supraclavicular fossa in the coronal oblique plane. It was determined that the hypoechoic, pulsating subclavian artery was situated above the hyperechoic first rib. A characteristic honeycomb appearance was observed in the hypoechoic nerve structures (trunks or divisions) posterolateral to the artery. The needle entry point was invaded with 2 ml of 2% lidocaine. An in-plane technique was utilized for developing a sterile 50 mm 18-gauge IV cannula. The local antiesthetic was injected at the site for a duration of over 3 to 5 minutes after the needle was well-visible &the tip was positioned towards the nerve bundle following a negative aspiration. Ultrasound was employed to observe the dispersion of local anesthetic at the time of injection. The needle tip position was repositioned to ensure that the anesthetic was distributed appropriately if the spread didn't reach a specific area of the plexus (figure 2a&b).

a) 

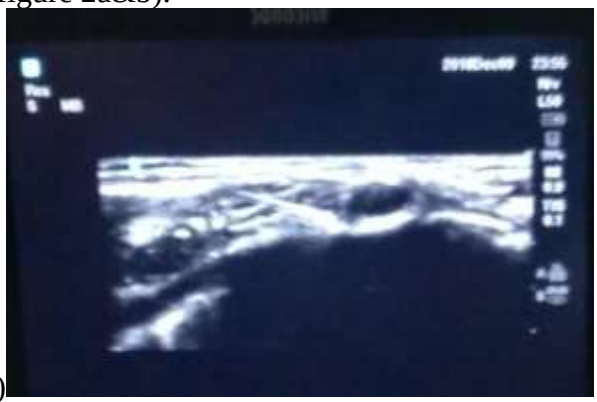
b) 

**Figure (2): a)** Sonoanatomy of SPB. A) Subclavian artery, * Brachial plexus, R) First rib & P) Pleura). **b)** Needle visualization.

## Evaluation parameters:

1- **The Hemodynamic Parameters:** Heart rate, oxygen saturation, & mean arterial blood pressure have been observed preoperatively (baseline) &every 15 minutes during the course of the surgery, as well as two, six, &twelve hours postoperatively.
2- **Assessment of onset & period of sensory block:** A pinprick sensation was used to evaluate the sensory block in all dermatomes innervated via the BPB (C5-T1) in the distribution of radial, median, ulnar, & musculocutaneous nerves. The needle has been blunt 25-G.
3- **Assessment of onset & period of motor block**
4- **First request of analgesia:** The VAS scoring was utilized to assess pain during the initial hour postoperatively, as well as at 2, 6, 12, &24 hours following the operation. Whole analgesic dose needed in –first twenty-four-hour nalbuphine 0,03 -30 Ug\kg
5- **Visual Analog Scale (VAS):** Explaining VAS to the patient as a tool that is utilized for quantifying a subjective experience, like pain intensity. A 10-cm line usually utilized for VAS is marked by "no pain" on the left border &"worst pain imaginable" on the right edge. Following the operation, the VAS has been used to assess the level of pain, which varied among 0 (indicating no pain) &10 (worst pain imaginable). The anesthesiologist, that was unaware of the group of study drugs, evaluated &documented the VAS at the first hour postoperatively, as well as at the s$^{econd}$, s$^{ixth}$, 12$^{th}$, & 24$^{th}$ hours. Complication of technique & drug as pneumothorax` surgical emphysema ` any hemodynamic unstability, Nausea & vomiting if happened was planned to be treated with metoclopramide 10 mg IV. As well, any intra and /or postoperative manifestations or adverse impacts were documented.

**Statistical Analysis:** Data was entered into the computer &analyzed utilizing IBM SPSS Corp. which was published in 2013. Version 22.0 of IBM SPSS Statistics for Windows. IBM Corp. Armonk, NY. Numbers &percentages have been utilized for describing qualitative data. Parametric data has been defined utilizing the mean standard deviation (mean ± SD) &median (maximum &minimum) for quantitative data, following the Kolmogorov-Smirnov test to determine normality. Afterward, appropriate statistical analyses were carried out. The outcomes were assessed for significance at the 0.05 level.

## RESULTS

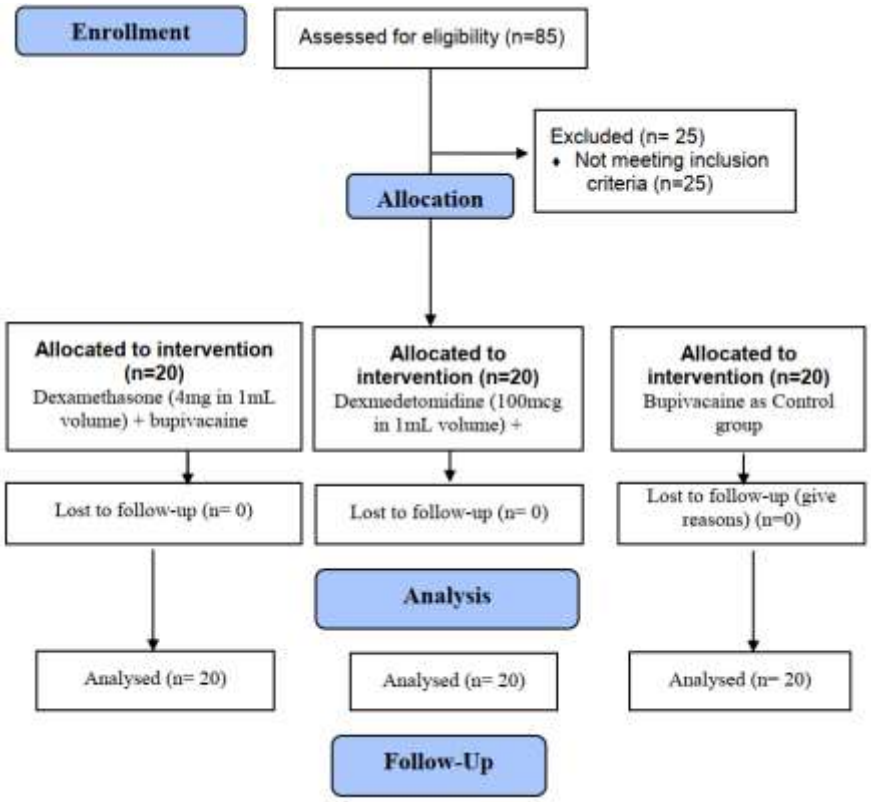



**Figure (3):** Consort flow chart viewing study design

**Table (1):** Comparative analysis of the general characteristics of the groups under investigation

| | **Dexamethasone group N=20 (X)** | **Dexmedetomidine group N=20 (D)** | **Control group N=20 (B)** | **significance Test** | **in group significance** |
|---|---|---|---|---|---|
| Age / years mean± standard deviation | 37.85±12.92 | 35.0±11.02 | 40.70±12.57 | F=1.09<br>P=0.342 | P1=0.463<br>P2=0.463<br>P3=0.145 |
| SEX N (%)<br>Male<br>Female | <br>11(55.0)<br>9(45.0) | <br>14(70.0)<br>6(30.0) | <br>13(65.0)<br>7(35.0) | <br>$X^2$=1.01<br>P=0.605 | P1=0.327<br>P2=0.519<br>P3=0.736 |
| ASA<br>I<br>II | <br>6(30.0)<br>14(70.0) | <br>7(35.0)<br>13(65.0) | <br>10(50.0)<br>10(50.0) | <br>$X^2$=1.83<br>P=0.400 | P1=0.736<br>P2=0.197<br>P3=0.337 |

*F: One Way ANOVA test, $X^2$= Chi-Square test, p1: variance among dexamethasone group & Dexmedetomidine group, p2: variance among dexamethasone group & control group, p3: variance among control & Dexmedetomidine group*

Table (1) demonstrates that no statistically significant variance among examined groups regarding age, sex & ASA score.

**Table (2):** Comparison of analgesic characteristics among examined groups

| | **Dexamethasone group N=20** | **Dexmedetomidine group N=20** | **Control group N=20** | **significance Test** | **Within group significance** |
|---|---|---|---|---|---|
| Duration of surgery (min) | 89.25±8.68 | 91.80±7.67 | 90.95±8.65 | F=0.484<br>P=0.619 | P1=0.338<br>P2=0.522<br>P3=0.749 |
| Onset of sensory block (min) | 7.05±2.24 | 5.50±1.70 | 9.8±1.57 | F=27.42<br>P <0.001* | P1=0.01*<br>P2=0.001*<br>P3=0.001* |
| Complete sensory block (min) | 17.70±1.98 | 15.0±2.20 | 19.70±3.24 | F=5.87<br>P =0.005* | P1=0.001*<br>P2=0.016*<br>P3=0.001* |
| Duration of sensory block (min) | 13.0±2.36 | 19.66±2.13 | 8.10±3.08 | F=102.89<br>P <0.001* | P1=0.016*<br>P2<0.001*<br>P3<0.001* |
| Onset of motor block (min) | 7.15±1.18 | 5.75±1.37 | 9.25±1.52 | F=33.36<br>P <0.001* | P1=0.002*<br>P2=0.001*<br>P3=0.001* |
| Complete motor block (min) | 22.30±1.08 | 19.30±1.66 | 25.5±2.28 | F=30.62<br>P <0.001* | P1=0.001*<br>P2=0.001*<br>P3=0.001* |
| Duration of motor block (min) | 13.25±2.19 | 17.15±1.18 | 11.85±2.92 | F=150.4<br>P <0.001* | P1=0.001*<br>P2=0.05*<br>P3<0.001* |
| First analgesic rescue (hours) | 14.05±2.28 | 20.35±2.76 | 8.15±14.42 | F=150.45<br>P <0.001* | P1<0.01*<br>P2<0.001*<br>P3<0.001* |
| Total analgesic dose (ug) (nalbuphine) (hours) | 79.75±11.75 | 47.75±25.36 | 92.80±18.32 | F=28.86<br>P-value <0.001* | P1<0.001*<br>P2=0.037*<br>P3<0.001* |

*F: One Way ANOVA test, p1: variance among dexamethasone group & Dexmedetomidine group, p2: variance among dexamethasone group & control group, p3: variance among control & Dexmedetomidine group, *Statistically significant, Parameters defined as mean± standard deviation*

Table (2) illustrates no statistically significant variance among examined groups regarding surgery duration with mean duration (89.25±8.68, 91.80±7.67 & 90.95±8.65, respectively for Dexamethasone, Dexmedetomidine & control group, respectively. Mean onset of motor& sensory block, have been demonstrated being faster in Dexmedetomidine (than Dexamethasone group and the most delayed control group (9.8 ± 1.57) with statistically significant difference between them. Achieving complete sensory & motor block have been demonstrated to be quicker in Dexmedetomidine than Dexamethasone group and the most delayed control group with statistically significant variance among them. Sensory &motor block period were longer for Dexmedetomidine than Dexamethasone group and the shortest was for control group with statistically significant variance among them. Mean time to request first rescue analgesic was delayed for Dexmedetomidine (20.35±2.76 hours), followed by Dexamethasone group (14.05±2.28 hours) and the shortest duration was for control group (8.15±14.42 hours) with statistically significant difference between them. Mean total analgesic dose (Nalbuphine 0,3-30Ug \kg) were higher among control group followed by dexamethasone group and the lowest dose was detected for Dexmedetomidine group with statistically significant difference between them (92.80±18.32, 79.75±11.75 &47.75±25.36, respectively).

**Table (3):** Comparison of heart rate intra& postoperative among studied groups.

| heart rate (beat/ minute) | Dexamethasone group N=20 | Dexmedetomidine group N=20 | Control group N=20 | Test of significance | Within group significance |
|---|---|---|---|---|---|
| Basal | 89.10±3.48 | 88.70±2.89 | 89.5±3.25 | F=0.310<br>P =0.735 | P1=0.695<br>P2=0.695<br>P3=0.435 |
| Immedityly After induction | 85.36±2.83 | 86.35±3.08 | 87.25±3.32 | F=2.0<br>P=0.145 | P1=0.286<br>P2=0.06<br>P3=0.360 |
| After<br>5 minute<br>Of inductin | 85.15±3.86 | 84.0±2.96 | 85.80±2.95 | F=1.54<br>P =0.222 | P1=0.275<br>P2=0.534<br>P3=0.09 |
| After 15 minutes<br>Of induction | 83.55±2.98 | 82.25±2.89 | 84.20±2.71 | F=2.40<br>P =0.100 | P1=0.157<br>P2=0.476<br>P3=0.051 |
| After 30 minutes<br>Of induction | 81.55±1.96 | 80.0±3.29 | 81.65±2.81 | F=2.27<br>P =0.112 | P1=0.08<br>P2=0.909<br>P3=0.062 |
| After 45 minutes<br>Of induction | 77.05±4.38 | 76.85±2.52 | 77.80±2.33 | F=0.486<br>P =0.618 | P1=0.845<br>P2=0.464<br>P3=0.354 |
| After 60 minutes<br>Of induction | 78.55±1.99 | 77.45±1.67 | 78.30±1.69 | F=2.08<br>P =0.134 | P1=0.06<br>P2=0.66<br>P3=0.138 |
| Post operative 1 h | 77.80±1.51 | 77.55±1.32 | 78.25±1.48 | F=1.22<br>P =0.304 | P1=0.585<br>P2=0.327<br>P3=0.129 |
| Post operative 2 h | 76.65±1.31 | 76.95±1.14 | 77.05±1.57 | F=0.473<br>P =0.626 | P1=0.486<br>P2=0.354<br>P3=0.816 |
| After 4 hours<br>Post operative | 79.30±4.67 | 77.60±4.97 | 78.55±4.49 | F=0.654<br>P =0.524 | P1=0.259<br>P2=0.617<br>P3=0.07 |
| After 6 hours<br>Post oprtative | 80.65±4.44 | 78.65±5.41 | 77.80±4.75 | F=1.79<br>P-value =0.176 | P1=0.201<br>P2=0.07<br>P3=0.584 |

*F: One Way ANOVA test, p1: variance among dexamethasone group & Dexmedetomidine group, p2: variance among dexamethasone group & control group, p3: variance among control & Dexmedetomidine group*

Table (3) demonstrates no statistically significant variance among examined groups regarding heart rate intraoperative & postoperative during different follow up periods.

**Table (4):** Comparison of MAP among studied groups.

| Mean arterial blood pressure | Dexamethasone group N=20 | Dexmedetomidine group N=20 | Control group N=20 | Test of significance | Within group significance |
|---|---|---|---|---|---|
| Basal | 93.10±8.03 | 92.05±6.09 | 92.40±4.75 | F=0.138<br>P =0.871 | P1=0.608<br>P2=0.732<br>P3=0.864 |
| Immeditialy After induction | 89.70±6.51 | 89.45±5.40 | 90.05±4.48 | F=0.06<br>P =0.942 | P1=0.87<br>P2=0.842<br>P3=0.733 |
| After<br>5 minute of<br>Induction | 88.65±6.54 | 87.80±5.56 | 88.10±4.35 | F=0.120<br>P =0.887 | P1=0.630<br>P2=0.755<br>P3=0.865 |
| After 15 minutes<br>Of induction | 87.20±5.33 | 85.85±4.87 | 86.20±3.76 | F=0.444<br>P =0.644 | P1=0.368<br>P2=0.504<br>P3=0.815 |
| After 30 minutes<br>Of induction | 85.35±4.32 | 85.05±3.94 | 85.55±2.67 | F=0.092<br>P =0.912 | P1=0.799<br>P2=0.865<br>P3=0.672 |
| After 45 minutes<br>Of induction | 81.35±3.48 | 83.15±3.80 | 82.70±2.81 | F=1.53<br>P =0.226 | P1=0.09<br>P2=0.213<br>P3=0.676 |
| After 60 minutes<br>Of indction | 80.15±2.99 | 81.35±3.42 | 81.70±2.13 | F=1.57<br>P =0.217 | P1=0.196<br>P2=0.096<br>P3=0.704 |
| Post operative 1 h | 77.25±6.96 | 80.20±5.81 | 80.40±6.67 | F=1.47<br>P =0.238 | P1=0.156<br>P2=0.131<br>P3=0.923 |
| Post operative 2 h | 77.10±4.39 | 79.15±4.45 | 78.0±5.08 | F=0.975<br>P =0.383 | P1=0.169<br>P2=0.543<br>P3=0.438 |
| After 4 hours post operative | 77.80±5.72 | 80.50±5.79 | 80.9±4.80 | F=1.91<br>P =0.157 | P1=0.123<br>P2=0.078<br>P3=0.817 |
| After 6 hours post operative | 79.05±4.02 | 80.95±3.83 | 81.15±3.22 | F=1.96<br>P =0.151 | P1=0.110<br>P2=0.08<br>P3=0.865 |

Table (4) shows no statistically significant variance among examined groups regarding mean arterial blood pressure intraoperative and postoperative during different follow up periods.

**Table (5):** Comparison of SPO2 among examined groups

| SPO2 | Dexamethasone group N=20 | Dexmedetomidine group N=20 | Control group N=20 | Test of significance | Within group significance |
|---|---|---|---|---|---|
| Basal | 98.70±0.92 | 98.75±0.85 | 98.35±0.81 | F=1.27<br>P=0.288 | P1=0.855<br>P2=0.205<br>P3=0.148 |
| Immeditialy After induction | 99.30±0.57 | 99.15±0.59 | 99.55±0.60 | F=2.36<br>P=0.103 | P1=0.423<br>P2=0.184<br>P3=0.051 |
| After 5 minute of induction | 99.20±0.62 | 99.25±0.64 | 99.35±0.59 | F=0.309<br>P=0.735 | P1=0.798<br>P2=0.443<br>P3=0.609 |
| After 15 minutes of induction | 99.50±0.51 | 99.35±0.48 | 99.40±0.59 | F=0.407<br>P=0.668 | P1=0.380<br>P2=0.557<br>P3=0.769 |
| After 30 minutes Of induction | 99.50±0.51 | 99.35±0.49 | 99.35±0.58 | F=0.531<br>P=0.591 | P1=0.376<br>P2=0.376<br>P3=1.0 |
| After 45 minutes Of induction | 99.45±0.51 | 99.50±0.51 | 99.50±0.61 | F=0.056<br>P=0.946 | P1=0.773<br>P2=0.773<br>P3=1.0 |
| After 60 minutes of induction | 99.40±0.50 | 99.55±0.51 | 99.30±0.57 | F=1.13<br>P=0.33 | P1=0.374<br>P2=0.552<br>P3=0.141 |
| Post operative 1 h | 99.40±0.59 | 99.35±0.48 | 99.65±0.48 | F=1.85<br>P=0.166 | P1=0.766<br>P2=0.140<br>P3=0.08 |
| Post operative 2 h | 99.20±6.16 | 99.40±0.50 | 99.45±0.51 | F=1.18<br>P=0.316 | P1=0.251<br>P2=0.153<br>P3=0.773 |
| After 4 hours post operative | 99.10±0.72 | 98.75±0.85 | 98.85±0.81 | F=1.03<br>P=0.365 | P1=0.170<br>P2=0.325<br>P3=0.693 |
| After 6 hours post operative | 99.20±0.62 | 99.25±0.64 | 99.25±0.55 | F=0.046<br>P=0.955 | P1=0.794<br>P2=0.794<br>P3=1.0 |

Table (5) demonstrates non statistically significant variance among studied groups regarding mean SPO2 intraoperative & postoperative during different follow up periods.

**Table (6):** Comparison of VAS Score among examined groups

| VAS score Points from 0 – 10 | Dexamethasone group N=20 | Dexmedetomidine group N=20 | Control group N=20 | Test of significance | Within group significance |
|---|---|---|---|---|---|
| After 1 hour post operative | 3(0-4) | 1(0-3) | 4(0-5) | KW=17.62<br>P<0.001* | P1=0.001*<br>P2=0.125<br>P3<0.001* |
| After 2 hours post operative | 2(1-4) | 0(0-4) | 3(0-6) | KW=24.75<br>P<0.001* | P1=0.001*<br>P2=0.008*<br>P3<0.001* |
| After 6 hours post operative | 3(1-5) | 2(0-5) | 4(1-6) | KW=12.1<br>P=0.002* | P1=0.04*<br>P2=0.07<br>P3<0.001* |
| After 12 hours post operative | 3(1-6) | 2(0-5) | 4(2-6) | KW=19.35<br>P<0.001* | P1=0.05*<br>P2=0.003*<br>P3<0.001* |
| After 24 hours post operative | 4(1-6) | 3(1-6) | 5(3-6) | KW=20.43<br>P<0.001* | P1=0.07<br>P2=0.003*<br>P3<0.001* |

KW: Kruskal Wallis test, p1: variance among dexamethasone group & Dexmedetomidine group, p2: variance among dexamethasone group & control group, p3: variance among control & Dexmedetomidine group Parameters described as median (min-max), *statistically significant

Table (6) illustrates a statistically significant variance among examined groups regarding median VAS score during follow up. Median VAS score postoperative was highest among control group followed by dexamethasone group and least for dexmedetomidine group.

**Table (7):** Comparison of complications between studied groups

| Complications | Dexamethasone group N=20 | Dexmedetomidine group N=20 | Control group N=20 | Test of significance | Within group significance |
|---|---|---|---|---|---|
| Nausea | 2(10.0%) | 1(5.0%) | 1(5.0%) | MC=0.635 P=0.765 | P1=1.0 P2=1.0 P3=1.0 |
| Hypotension | 1(5.0%) | 1(5.0%) | 1(5.0%) | MC=0.0 P=1.0 | P1=1.0 P2=1.0 P3=1.0 |
| Bradycardia | 1 (5.0%) | 2(10.0%) | 1(5.0%) | MC=o.635 P=0.765 | P1=1.0 P2=1.0 P3=1.0 |
| Pneumothorax | 0 (0.0%) | 0(0.0%) | 0(0.0%) | MC=0 P=0 | P1=0 P2=0 P3=0 |

MC: Monte Carlo test, p1: variance among dexamethasone group & Dexmedetomidine group, p2: variance among dexamethasone group & control group, p3: variance among control & Dexmedetomidine group

Table (7) demonstrates that no statistically significant variance among examined groups regarding incidence of complications. Nausea was detected among 2 cases of dexamethasone group, 1 case of dexmedetomidine group & 1 case of control group. Hypotension was detected among 1 case of dexamethasone group, 1 case of dexmedetomidine group & 1 case of control group

## DISCUSSION

The research purposed to evaluate Dexamethasone impact (4mg within 1mL volume) &Dexmedetomidine (100mcg within 1mL volume) when combined with bupivacaine (20 ml 0.5%) on the duration &onset of supraclavicular BPB in cases having upper extremity operations.

In this research we found that no statistically significant variance was found among examined groups as regard age, sex & ASA score. Mean age of dexamethasone group is 37.85±12.92 years, for Dexmedetomidine group the mean age is 35.0±11.02 years and 40.70±12.57 years for control group.

In ***Devi et al. [6]*** research the mean age was 35.20±8.56 years in Dexmedetomidine group & 34.57±10.31 years in Dexamethasone group. The ratio between man to woman was equal (Ratio=1:1).

***Hamada et al. [7]*** found that according general characteristics & operative characteristics non statistically significant variance among both groups.

In this research we demonstrated that mean onset of sensory and motor block was found begin quicker in the Dexmedetomidine group compared to the Dexamethasone group and the most delayed is for control group with statistically significant variance among them. Achieving complete sensory & motor block were found to be early in Dexmedetomidine than Dexamethasone group and the most delayed is for control group with statistically significant variance among them.

In accordance with our results, the sensory block's onset time was documented being shortened by adding dexmedetomidine to the local anesthetic during the BPB in two previous randomized double-blinded trials performed by ***Bisui et al. [8]*** & ***Kaur et al. [9]***, as well as a meta-analysis conducted by ***Abdallah and Brucell [10]***.

***Adinarayanan et al. [11]*** utilized a control group that included the dexamethasone & dexmedetomidine groups. The results of these studies indicate that the onset of motor block was significantly quicker in the dexmedetomidine group compared to the dexamethasone group. The outcomes are in accordance with the present study's outcomes, that suggest that the onset of motor block was significantly quicker in the dexmedetomidine compared to the dexamethasone while, ***Singh et al. [12]*** performed a comparison of dexmedetomidine &dexamethasone in the BPB under ultrasound guidance.

***Iyengar et al. [13]*** demonstrated that comparing with the dexamethasone group, the dexmedetomidine group exhibited a lesser mean time of onset of sensory block (13.23 ± 3.46 minutes versus 10.87 ± 2.22 minutes).

***Vieira et al. [14]*** Vieira et al. [14] supplied twenty ml of a local antiesthetic combined with dexamethasone adjuvant to 88 cases that were scheduled for shoulder arthroscopy in order to conduct an ultrasound-guided interscalene BPB. The motor & sensory blockade onset in the dexamethasone group wasn't significantly reduced in comparison to the control group.

This conflict, might be because of the variance in the local anesthetic volume & block method ***Vieira et al. [14]*** supplied twenty milliliters of a local anesthetic combined with dexamethasone adjuvant to 88 cases that have been scheduled for shoulder arthroscopy in order to perform an ultrasound-guided interscalene BPB. The motor & sensory blockade onset in the dexamethasone group wasn't significantly reduced comparing with the control group. The potential cause of this discrepancy is the differential in the local anesthetic volume &blockade procedure.

In contrast to our results, ***Vieira et al. [14]*** supplied twenty milliliters of the local anesthetic combined with dexamethasone adjuvant to 88 cases that were scheduled for shoulder arthroscopy in order to perform ultrasound-guided interscalene BPB. The dexamethasone group didn't exhibit a significant decrease in the motor & sensory blockade onset when contrasted with the control group (local anesthetic without additive). Variations in local anesthetic volume &the technique of block may account for this discrepancy.

In this research we illustrated that longer duration of motor & sensory block has been detected for Dexmedetomidine than Dexamethasone group and the shortest is for control group with statistically significant variance among them.

This outcome agreed with ***Hamada et al. [7]*** that revealed that mean period of motor & sensory functions, &also analgesia period, has been significantly extended in the dexmedetomidine group once contrasted with dexamethasone.

***Devi et al. [6]*** showed that the period of sensory &motor block was significantly longer in the dexmedetomidine to bupivacaine group compared to the dexamethasone to bupivacaine group. The mean duration of sensory block was 813.87±113.72 minutes in the dexmedetomidine group and 752.63±27.96 minutes in the dexamethasone group (p=0.006). The mean duration of motor block was 734.13±84.44 minutes in the dexmedetomidine group and 533.07±88.38 minutes in the dexamethasone group (p=0.0005).

***Gunaseelan and Kumar [15]*** conducted a further investigation in which they examined Motor &sensory blockage duration, as well as following surgery pain relief, after administering axillary block with the adding of dexmedetomidine & dexamethasone into bupivacaine. The researchers noted a prolonged duration in the dexmedetomidine group.

***Khaleeq et al. [16]*** *&* ***Gautam & Varghese [17]*** The adjuvant dexmedetomidine qualities as a block of supraclavicular-brachial-plexus with extended analgesia period were additionally detailed, with identical outcomes observed.

***Marhofer et al. [18] & Brummett et al. [19]*** discovered that the dexmedetomidine analgesic effect might be because of its ability to block the hyperpolarization-activated cation current. This prevents the nerves from returning to their resting state and generating new action potentials. The current seems to have a stronger effect on the unmyelinated C fibers, which are responsible for pain, compared to the A α fibers, which are involved in motor function. Hence, the mechanism behind the enhancement of local anesthetics in peripheral nerve block by dexmedetomidine might be attributed to its preferred inhibition of pain transmission rather than motor response.

In this study we found that mean time to request first rescue analgesic was delayed for Dexmedetomidine (20.35±2.76 hours), followed by Dexamethasone group (14.05±2.28 hours) and the shortest duration is for control group (8.15±14.42 hours) with statistically significant variance among them.

Also, ***Devi et al. [6]*** demonstrated that comparing with dexamethasone to bupivacaine (Group A; 805.77±84.83 min), the mean time for requesting rescue analgesia has been additionally significantly higher in dexmedetomidine to bupivacaine (Group B; 1320.73±150.59 minute).

In this study we demonstrated that mean total analgesic dose is higher among control group followed by dexamethasone group and the lowest dose was detected for dexametamodine group with statistically significant difference between them (92.80±18.32, 79.75±11.75 &47.75±25.36, respectively).

In addition, ***Nagaraju et al. [20]*** demonstrated that comparing with the dexamethasone group, the dexmedetomidine group required a significantly lesser total tramadol dosage during the first twenty-four hours.

Also, ***Ammar & Mahmoud [21]*** demonstrated significantly declined necessity of IV morphine (4.9 mg vs 13.6 mg) as rescue analgesic with dexmedetomidine as adjunct in infraclavicular BPB.

As regard HR, SPO2 & blood pressure intraoperative & postoperative during different follow up periods. We discovered that no statistically significant variance withing the groups that were examined.

The present outcomes agreed with ***El-Feky & Abd El Aziz [22]*** There were no significant variations among dexamethasone & dexmedetomidine as adjuvants to local anesthesia in terms of intraoperative HR &MAP measurements.

Such results agreed with ***Oriba et al. [23]*** that showed no significant variance among the 3 groups according the intraoperative HR & MAP measurements, so, representing equally efficient analgesia with block within the 3 groups (P value>0.05).

***Azemati et al. [24]*** study indicated that systolic blood pressure (SBP) was not different between bupivacaine dexmedetomidine and bupivacaine only groups.

***Khalil et al. [25]*** found that the outcomes didn't show a statistically significant variance within the tested groups in terms of spO2 after 5, 15, &30 minutes (P value>0.05).

In this research we cleared that Median VAS score postoperative was highest among control group followed by dexamethasone group & least for dexmedetomidine group. The statistically significant difference is detected between the following pairs (between dexamethasone & control group, p=0.003) & (between Dexmedetomidine & control group, p<0.001).

***Nagaraju et al. [20]*** found that the mean VAS scoring in the dexmedetomidine group was significantly fewer than that in the dexamethasone group through the initial twenty-four hours.

***Badran et al. [26]*** found that the dexamethasone-ropivacaine group had significantly fewer VAS scores (2.5–3.3) than the ropivacaine group (4.2–5.06) (P < 0.05), &CASES in this group exhibited excellent pain control for a maximum of twenty-four hours.

In this research we detected that no statistically significant variance was found within examined groups regarding incidence of complications. Nausea was detected among 2 cases of dexamethasone group, 1 case of dexametamodine group and 1 case of control group. Hypotension was detected among 1 case of dexamethasone group, 1 case of dexametamodine group and 1 case of control group.

Such findings agreed with studies by ***El-Feky and Abd El Aziz [22]*** that indicated no significant increase in postoperative negative impacts (vomiting, respiratory depression, & itching) among both dexamethasone and dexmedetomidine groups

***Hamada et al. [7]*** research comparing dexamethasone & dexmedetomidine as adjunct to bupivacaine in ultrasound-guided supraclavicular BPB in upper extremity operations found no complications associated with the block techniques including nausea & vomiting, damage to underlying structures, hemodynamic instability, infection, hematoma formation, or local anaesthetic toxicity.

## CONCLUSIONS

The mean VAS score, the onset time for the motor & sensory blockade, &opioid consumption were all efficiently lowered by adding dexamethasone or dexmedetomidine as an adjunct to bupivacaine, as we have concluded. In addition, it extended the period of the sensory& motor block, &postoperative analgesic period. Furthermore, Dexmedetomidine is an excellent choice for reducing the duration &quality of supraclavicular BPB, &also for reducing the onset of motor &sensory block, without negative side effects.

### DECLRATIONS

### ETHICS APPROVAL & CONSENT TO PARTICIPATE

Prior to starting the recruitment process for the subject, the research was accepted. The ethics committee of the Faculty of Medicine at Al Azhar University granted its approval.

### CONSENT FOR PUBLICATION

Inapplicable.

### AVAILABILITY OF DATA AND MATERIAL

Data is accessible from the corresponding author upon reasonable request.

**COMPETING INTERESTS**

The authors haven't conflicts of interest for declaring that are relevant to the article content.

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**AUTHORS' CONTRIBUTIONS**

M S A, M M A, conceived the study & designed it. All authors contributed equally to data gathering & data evaluation. Manuscript and Statistical analysis was written and done by M S A, H A E. The manuscript has been reviewed & approved by all authors.

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## REFERENCES

**1- Wells PN (2020).** Physics of ultrasound .in ultrasound exposimetry (pp.9-45). CRC Press.

**2- Griffith JF (2018).** Ultrasound of the brachial plexus. In Seminars in musculoskeletal radiology (Vol. 22, No. 03, pp. 323-333). Thieme Medical Publishers.

**3- Vakkapatti M, Shenoy T, Bhat S (2019).** Comparison of a combination of caudal levobupivacaine with fentanyl and levobupivacaine alone for alleviating postoperative pain during infraumbilical procedures in children under 3 years. The Open Pain Journal. 12(1).

**4- Spoorenberg SM, Deneer VH, and Grutters JC (2014).** Pharmacokinetics of oral vs. intravenous dexamethasone in patients hospitalized with community-acquired pneumonia. Br J Clin Pharmacol, (7) 133-137.

**5- Kandil Y (2018).** Sensory and motor effects of dexmedetomidine as an adjuvant to bupivacaine for brachial plexus block. Al-Azhar Assiut Medical Journal, 16(4), 343

**6- Devi N, Kumar V, Jamil A, Ali S, Soomro ZA and Zafar A (2023).** Comparison of Dexmedetomidine and Dexamethasone as an Adjuvant to Bupivacaine in Onset and Interval of Supraclavicular Nerve Block. Pakistan Journal of Medical & Health Sciences, 17(06), 180-180.

**7- Hamada MH, Ibrahim WM, Ashiry MA (2019).** Comparative study between Dexmedetomidine and Dexamethasone as an adjuvant to Bupivacaine in ultrasound guided supraclavicular brachial plexus block in upperlimb surgeries. Egyptian J Hosp Med 2019;75(6):3060-9.

**8- Bisui B, Samanta S, Ghoshmaulik S, Banerjee A, Ghosh TR and Sarkar S (2017).** Effect of locally administered dexmedetomidine as adjuvant to levobupivacaine in supraclavicular brachial plexus block: double-blind controlled study. Anesthesia, essays and researches, 11(4), 981.

**9- Kaur H, Singh G, Rani S, Gupta KK, Kumar M, Rajpal AS and Aggarwal S (2015).** Effect of dexmedetomidine as an adjuvant to levobupivacaine in supraclavicular brachial plexus block: a randomized double-blind prospective study. Journal of anaesthesiology, clinical pharmacology, 31(3), 333.

**10- Abdallah FW and Brull R (2013).** Facilitatory effects of perineural dexmedetomidine on neuraxial and peripheral nerve block: a systematic review and meta-analysis. British journal of anaesthesia, 110(6), 915-925.

**11- Adinarayanan S, Chandran R, Swaminathan S, Srinivasan G and Bidkar PU (2019).** Comparison of dexamethasone and dexmedetomidine as adjuvants to bupivacaine in supraclavicular brachial plexus block: a prospective randomized study. Indian J Clin Anaesth, 6(4), 523-7.

**12- Singh N, Gupta S and Kathuria S (2020).** Dexmedetomidine vs dexamethasone as an adjuvant to 0.5% ropivacaine in ultrasound-guided supraclavicular brachial plexus block. Journal of anaesthesiology, clinical pharmacology, 36(2), 238.

**13- Iyengar SS, Pangotra A, Abhishek K, Sinha N, Rao NS, Singh VK and Roy D (2023).** The Comparison of Dexmedetomidine to Dexamethasone as Adjuvants to Bupivacaine in Ultrasound-Guided Infraclavicular Brachial Plexus Block in Upper Limb Surgeries. Cureus, 15(7).

**14- Vieira PA, Pulai I, Tsao GC, Manikantan P, Keller B and Connelly NR (2010).** Dexamethasone with bupivacaine increases duration of analgesia in ultrasound-guided interscalene brachial plexus blockade. European Journal of Anaesthesiology| EJA, 27(3), 285-288.

**15- Gunaseelan S, Kumar AJ (2018).** Comparison of motor blockade, sensory blockade and duration of analgesia between dexmedetomidine and dexamethasone as an adjuvant to bupivacaine in axillary block: Indian J Clin Anaesthesia; 5(3):437-9.

**16- Khaleeq S, Azam M, Siddiq S, Shahid A, Butt Z, Asad N (2020).** Comparison of dexmedetomidine and dexamethasone as adjuvant to bupivacaine in supraclavicular brachial plexus block. APMC; 14(2):122-5.

**17- Gautam A, Varghese RS (2022).** Comparison of effectiveness of dexamethasone and dexmedetomidine as an adjuvant in plexus block by supraclavicular approach.Eur J Molecular Clin Med 9(05).

**18- Marhofer D, Kettner SC, Marhofer S et al. (2012).** Dexmedetomidine as an adjuvant to ropivacaine prolongs peripheral nerve block: A volunteer study. Br J Anesth., 15:438-442.

**19- Brummett CM, Norat MA, Palmisano JM, Lydic R (2008):** Perineural administration of dexmedetomidine in combination with bupivacaine enhances sensory and motor blockade in sciatic nerve block without inducing neurotoxicity in rat. Anesthesiology, 109:502–511.

**20- Nagaraju A, Sahu L, Das S, Muni M & Muni MK (2023).** Comparative Evaluation of Dexmedetomidine and Dexamethasone as Adjuvants in Supraclavicular Brachial Plexus Block. Cureus, 15(5).

**21- Ammar AS and Mahmoud KM (2012).** Ultrasound-guided single injection infraclavicular brachial plexus block using bupivacaine alone or combined with dexmedetomidine for pain control in upper limb surgery: A prospective randomized controlled trial. Saudi J Anaesth. 6:109–14.

**22- El-Feky EM and Abd El Aziz AA (2015).** Fentanyl, dexmedetomidine, dexamethasone as adjuvant to local anesthetics in caudal analgesia in pediatrics: A comparative study. Egyptian journal of anaesthesia, 31(2), pp.175-180.

**23- Oriba AAA, Makharita MY, Messeha MM and Atia AAA (2021).** Dexmedetomidine versus Dexamethasone as Adjuvants to Bupivacaine for Ultrasound Guided Rectus Sheath Block in Pediatric Abdominal Surgery. The Egyptian Journal of Hospital Medicine, 84(1), pp.2270-2278.

**24- Azemati S, Pourali A and Aghazadeh S (2020).** Effects of adding dexmedetomidine to local infiltration of bupivacaine on postoperative pain in pediatric herniorrhaphy: a randomized clinical trial. Korean journal of anesthesiology, 73(3), p.212.

**25- Khalil KSA, Rashwan SAA and Hussein HAEW (2023).** Dexamethasone versus Dexmedetomidine as an Adjuvant to Bupivacaine for Ilioinguinal and Iliohypogastric Nerve Block in Pediatrics, Comparative Randomized Double-Blind Study. Egyptian Journal of Medical Research, 4(2), 27-42.

**26- Badran MAEFM, Kamaly AM, Abdel Hamid HM & Mostafa RH (2020).** Dexamethasone as a bupivacaine adjuvant for ultrasound-guided interscalene brachial plexus block: a prospective randomized study. Ain-Shams Journal of Anesthesiology, 12(1), 1-10.