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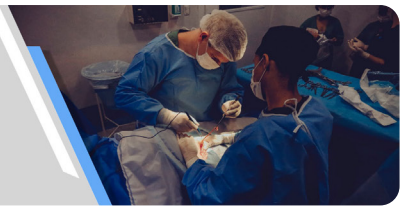

Efficacy of Dexamethasone and Fentanyl as an Adjuvant with Lignocaine-Adrenaline and Bupivacaine for Supraclavicular Brachial Plexus Block in Upper Limb Surgery

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Abstract

Supraclavicular Brachial Plexus Block (SCBB) has become one of the most important anaesthesia techniques for upper limb surgeries. It also provides analgesia during postoperative period. An adjuvant can prolong the action of local anaesthetics after single injection of SCBB. This study was designed to evaluate the effectiveness of dexamethasone and fentanyl as an adjuvant for postoperative analgesia with Lignocaine- Adrenaline and Bupivacaine in SCBB among patients underwent upper limb surgery. This randomized controlled trial was carried out at Department of Anaesthesia and Intensive Care Medicine, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh. A total of 90 patients were enrolled. All study patients were allocated into three groups and each group was consisted 30 patients: Group-A received local anaesthetic with adrenaline solution; Group-B received local anaesthetic solution with adrenaline and fentanyl; Group-C received local anaesthetic solution with adrenaline and dexamethasone. SCBB was done with the ultrasound guidance. It was observed that, the required time onset of sensory and motor blocks were less in group B. But the duration of sensory and motor blocks were prolonged in group C. The time for 1st rescue analgesic within 24 hours and total analgesic requirements were less in group C. The side effects like dyspnoea or chest discomfort, nausea, itching and shivering were less in group C. This study concluded that both dexamethasone and fentanyl are able to prolong duration of analgesia in SCBB, but dexamethasone is better as it provides analgesia for prolong periods with less complication during peri-operative period.

Keywords: Adrenaline; Dexamethasone; Fentanyl; Supraclavicular Brachial Plexus Block (SCBB); Upper Limb Surgery

Introduction

The mode of anaesthesia and postoperative pain management are important irrespective of surgery, which plays a crucial role in peri-operative care. Now-a-days peripheral nerve blocks are preferred because of more advantages over general anaesthesia particularly in upper limb surgeries [1,2]. Peripheral nerve blocks causes less hemodynamic instability, less respiratory depression, higher safety margin, more simplicity, less side effects than general anaesthesia [1]. Supraclavicular brachial plexus block (SCBB) provides very good intra-operative anaesthesia and also extends the analgesia in the postoperative period without any systemic side effects [2, 3, 4]. In addition, it offers a better preservation of mental functions in elderly; decreased risk of aspiration due

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to intact pharyngeal and laryngeal reflexes; avoids difficult intubation; decreases postoperative complications associated with intubation and provides better postoperative analgesia without undue sedation; facilitating early mobilization and discharge [5]. Ultrasound guided SCBB provides the superior success rate of block with excellent localization as well as improved safety rates and reduces the risk of complications [2, 6]. Conventional widely used local anaesthetics (LA) like-lignocaine and bupivacaine, which can provide analgesia for limited period of time [2]. Lignocaine is an effective local anaesthetic with a rapid onset of action and lasts for 60-90 minutes [2]. Bupivacaine is also a local anaesthetic of amide group, but four times more potent than lignocaine, slower in onset but has a significant longer duration of action [2]. However conventional local anaesthetics without adjuvant provide analgesia for not more than 4-8 hours [4]. Different adjuvant like epinephrine, bicarbonate, opioids, ketamine, midazolam, clonidine, neostigmine, dexamethasone and dexmeditomidine have been tried in combination with local anaesthetics in an attempt to achieve quick, dense and prolonged block [2, 7]. The advantage of this practice is twofold; first, it reduces the LA plasma concentration and thus minimizes the possibility of systemic toxicity and second is, it improves the quality and prolongs the duration of peripheral nerve block [8, 9]. Anaesthesiologists often add adjuvant to local anaesthetic agents during peripheral nerve block procedures. When fentanyl used as adjuvant to local anaesthetic for peripheral nerve blocks; it improved the quality of block and prolonged the duration of postoperative analgesia without increasing the side effects, moreover it could be used through intrathecal, and epidural routes [10]. It has been reported that opioid receptors are expressed by central and peripheral neurons especially within injured tissues and can attenuate the excitability of primary efferent neurons and lead to anti-nociceptive effects [11]. Dexamethasone is a very potent and highly selective glucocorticoid with analgesic property [2]. It relieves pain by reducing inflammation and blocking transmission of nociceptive C fibres and by suppressing ectopic neural discharge [2]. It was reported that, steroids induce vasoconstriction decreases the systemic absorption of local anaesthetic [12]. Peri-neural injection of steroids has been used to improve analgesia with no evidence suggesting neuritis when given in low concentration [13]. Intravenous dexamethasone has been previously shown to be opioid-sparing in the early postoperative phase between 24 – 48 hours following its administration and also serves to reduce postoperative nausea and vomiting [12]. Several clinical studies have evaluated the effectiveness of dexamethasone applied peri-neurally with LA in regional nerve blocks including epidural, brachial plexus, femoral and sciatic, and facial and dental blocks [12-14]. This study was carried out to compare analgesic and anaesthetic effect of local anaesthetic mixture with adrenaline when fentanyl or dexamethasone is adding as an adjuvant in supraclavicular brachial plexus block among patients underwent upper limb surgery.

Methodology

Study Design

This study was carried out at the Department of Anaesthesia and Intensive Care Medicine, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh. It was a randomized controlled trial and the study was conducted for twelve months after getting ethical approval from Institutional Review Board (IRB) of NITOR [Memo No. MEU-NITOR/Academy/2022/469; (date 08/02/2022)].

Study Population

A total of ninety (90) patients were selected according to the inclusion and exclusion criteria. Adult patients (age>18 years) of both sexes, underwent elective orthopedic surgeries of upper limb under supraclavicular brachial plexus block (SCBB) were included. Patients were excluded if they had allergy to amide local anaesthetic agents or study drugs, contralateral phrenic nerve palsy or pneumothorax, patients were on beta blockers, adrenoceptor agonists or antagonists or steroid therapy, patients having difficult anticipated anatomy on ultrasound, pregnant patients, patients with peripheral neuropathy or taking treatment for chronic pain, patients refused to participate this study and block failure.

Study Procedure

Patients were informed about the aim, objectives and procedure of the study; informed written consent was taken from each patient. Ninety adult patients aged between 20 to 60 years were enrolled for the study. Then study patients were randomly divided into three groups, where each group was consisted of 30 patients. History taking was focused on clinical features and disease duration. Relevant physical examination was done following standard protocol. All patients were educated about the 10 cm visual analogue scale (VAS) during the preoperative assessment.

On arrival to the operating room, a multi-parameter monitor was attached and the initial pulse, blood pressure (BP), respiratory rate (RR), oxygen saturation (SpO_2) etc were recorded as pre-block values. An 18 gauge IV cannula was inserted in a peripheral vein in the contra-lateral arm. All patients were pre-medicated with injection diazepam 10 mg intramuscularly 30 minutes before the block. The ultrasound machine (SonoScape) was equipped with a linear 12 MHz probe was used. The patient was kept lying supine and the head turned 45° to the contra-lateral side. The ultrasound probe was then placed in the coronal oblique plane in the supraclavicular fossa to visualize the subclavian artery and brachial plexus in its transverse sectional view. The brachial plexus was seen as a cluster of hypo-echoic nodules, often found lateral to the round pulsating hypo-echoic subclavian artery and lying on top of the hyper-echoic first rib. After

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the scout scan, skin was sterilized and a 22-gauge 50 mm Teflon coated needle was placed on the outer (lateral) end of the probe covered with a sterile covering and advanced along the long axis of the probe and in the same plane as the ultrasound beam. Needle movement was observed in real time. Once the needle reached the brachial plexus cluster, the drug was injected as single injection. The study patients were received drug preparation as follows:

Group-A: was received 30 ml of prepared solution which contain 10 ml of 2% lidocaine-adrenaline plus 15 ml of 0.5% bupivacaine and 5 ml of normal saline.

Group-B: was received 30 ml of prepared solution which contain 10 ml of 2% lidocaine-adrenaline plus 15 ml of 0.5% bupivacaine, 2 ml of fentanyl (100 µg) and 3 ml of normal saline.

Group-C: was received 30 ml of prepared solution which contain 10 ml of 2% lidocaine-adrenaline plus 15 ml of 0.5% bupivacaine, 2 ml of dexamethasone (10 mg) and 3 ml of normal saline.

Assessment of Blocks

The onset of sensory block was assessed with application of cold spirit swabs and by response to atraumatic prick with the blunt needle in different areas, onset time was defined as dull sensation along any of the nerve distribution; the time when sensory blockade achieved was noted.

Motor blockade was evaluated by Bromage scale (0 = lack of movement; 1 = decreased movements (trembling) of muscle groups; 2 = ability to move against gravity but not against the resistance, 3 = reduced strength, 4 = full muscle strength) every 5 minutes until the onset of complete motor block. The onset of motor block was defined as the time between administering the drug to the time the Bromage scale was ≤ 2. Surgery was started after the onset of both sensory and motor components of the block.

Outcome Measures

The primary outcome measures of the study was to assess postoperative pain scores by visual analogue scale (VAS, 0–10 cm) at rest in every 15 minutes for the first hour followed by every 2 hourly for the next 24 hours postoperatively. The secondary outcomes were to observe the time for rescue analgesia, total opioid requirement in 1st 24 hours (mg), the duration of sensory block (minutes) and time for motor recovery (minutes) during postoperative period. The time for rescue analgesia was the period from the administration of the block till the time the patient complained of pain (VAS≥5). The time require for rescue analgesia was record in hours during postoperatively for each patient. Injection pethidine (1.5 mg/kg) with antiemetic was administered intramuscularly as rescue analgesic. The total amount of pethidine was needed in first 24 hrs during postoperative period was recorded and it was considered as total opioid requirement in 1st 24 hours (mg). During peri-operative period different complications like nausea and vomiting, pruritus, urinary retention, respiratory depression and hematoma were observed accordingly. Patients were given sedation during the peri-operative period, if needed for anxiolytics. The vital signs of each study patient including heart rate (HR), blood pressure (BP), respiratory rate (RR), oxygen saturation (SpO_2) and sedation (evaluated according to the Ramsay sedation scale) were recorded every 15 minutes for the first hour followed by every 30 minutes for the next 4 hours and then hourly for the next 24 hours postoperatively. Hypotension and bradycardia were defined as a fall in blood pressure and heart rate, respectively, by more than 20% from the preoperative values. Respiratory depression was defined as a decreased in respiratory rate below 10 or a fall in oxygen saturation to ≤90%.

Analysis of Data

All data were collected in a data collection sheet. After completion of the data collection; data editing, validation and cross-checking were done to remove the inconsistencies. Finally, data were inputted into the computer based software Statistical Package for Social Sciences (SPSS) version- 26 and analysis was done accordingly. Continuous data were expressed as mean with standard deviation (±SD) and categorical data were expressed as numbers with percentages. Data were compared by the Student "t" test, Chi-squared test (X^2), and ANOVA as appropriate. A p value <0.05 was considered as statistically significant.

Results and Observations

Total 90 patients were selected for this prospective randomized controlled trail and then they were divided into three groups by computer generated random numbers. But after administration of SCBB, eight patients had block failure. So, finally data of 82 study patients (27 patients in group A, 28 patients in group B and 27 patients in group C) were analyzed. Basic data of the patients like demographic, clinical profile and duration of surgery were collected from the patient's record file. Other data like- heart rate (HR), systolic blood pressure (SBP), mean arterial pressure (MAP), time of onset of sensory block and motor block, duration of the sensory and motor block and peri-operative complications of the patients were recorded. It was observed that demographic characteristics like age, gender, body mass index (BMI) and duration of surgery had no significant difference between the three groups (p >0.05). Most of the patients of all three groups (66.7% in group A, 73.3% in group B and 76.7% in group C) were belonged to ASA class I, but there was no statistical difference was found between the groups (p >0.05). While, no significant difference was observed in case of failed block among three groups (Table- 1).

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Table- 1: Basic characteristics of the study population in different groups (N= 90)

Characteristics		Group A (n= 30)	Group B (n= 30)	Group C (n= 30)	p value		
					A versus B	B versus C	A versus C
Age (years)		39.7±7.4	42.1±8.3	41.5±7.8	0.428*	0.618*	0.576*
BMI (kg/m²)		27.3±4.2	28.1±4.8	26.4±4.5	0.479*	0.412*	0.506*
Duration of surgery(minutes)		102.7±10.6	106.3±11.2	99.8±10.3	0.436*	0.395*	0.411*
Gender	Male	19(63.3%)	18(60%)	21(70%)	0.341**	0.368**	0.363**
	Female	11(36.7%)	12(40%)	9(30%)	0.438**	0.415**	0.463**
ASA class	I	20(66.7%)	22(73.3%)	23(76.7%)	0.373**	0.329**	0.296**
	II	10(33.3%)	8(26.7%0	7(23.3%)	0.259**	0.428**	0.147**
Numbers of failed (SCBB) block		3(10%)	2(6.7%)	3(10%)	0.597**	0.597**	1.00**

Values were expressed as mean±SD and values within parenthesis indicates corresponding percentage (%), p value was determined by *Student t-test and **Chi-square test (χ2)

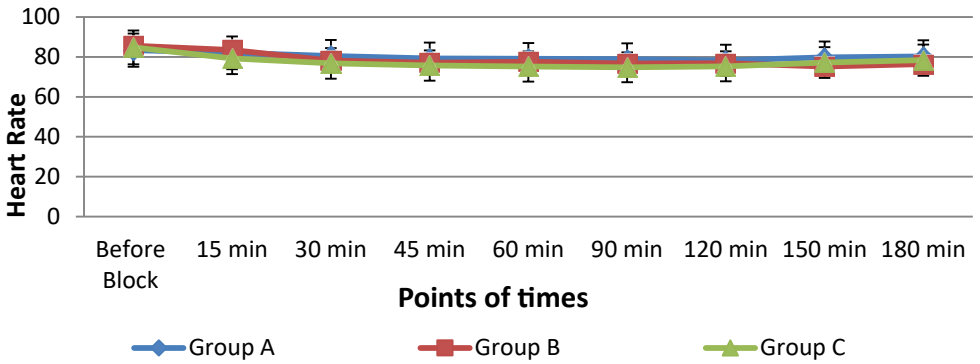

Figure- 1: Mean heart rate (beat/minute) during peri-operative period in three groups

In this study, no statistically significant difference was observed in different hemodynamic parameters (heart rate, mean arterial pressure) between three groups. ANOVA was performed to compare the hemodynamic parameters among the groups. Mean heart rate (beat/minute) during peri-operative period showed no significant difference between three groups (Figure-1). Similarly mean blood pressure (mm of Hg) during peri-operative period had no significant difference between three groups (Figure-2).

Regarding the time onset of blocks between the groups; the time for complete sensory block was lowest in group B (8.3±3.5 minutes) than group A (13.6±4.1 minutes) and group C (14.3±4.2 minutes), the time for the onset of maximum motor block was also less in group B (11.4±3.9 minutes) than group A (16.7±4.6 minutes) and group C (18.7±4.3 minutes), which was statistically significant ($p < 0.05$) (Table-2). Therefore, patients receiving fentanyl as an adjuvant for SCBB had quick onset of complete motor block then the patient who had received dexamethasone or normal saline as adjuvant. The duration of the sensory block was significantly prolonged in group C (954.3±38.5 minutes) than group B (586.6±29.7 minutes) and group A (312.9±24.8 minutes) ($p<0.05$). Similarly, when considered the time for motor recovery in between the three groups (278.4±18.7 minutes, 534.8±23.5 minutes and916.7±29.8 minutes in group A, B and C respectively), itwas also significantly longer in group C ($p<0.05$). So, it was observed that group C provides a significant prolong analgesia and motor block (Table- 2).

During the first 24 hours of postoperative period; the visual analogue scale (VAS) score was high at 6th, 14th and 20th hours in group A, on the other hand the VAS score was high at 10th and 18th hour in group B and in group C the VAS score was high at 16th hours (Table- 3). That indicates that patient was suffering from moderate to severe pain during these times. After giving rescue analgesia the VAS score was decreased as the pain was reduced (Table- 3).

When considering the time of first rescue analgesia (minutes) between three groups, it was significantly longer in group C (947.6±34.2 minutes) than group B (597.8±25.3 minutes) and group A (321.7±23.4 minutes) ($p<0.05$) (Table- 4). Therefore, patients receiving dexamethasone with bupivacaine provided longer duration of analgesia than fentanyl. Total analgesic (opioid) requirement in 1st 24 hours (mg) was significantly higher in group A (253.7±17.6 mg) than group B (173.6±14.3 mg) and group C (92.5±10.4 mg) ($p <0.05$), this finding indicated that patients were receiving dexamethasone with local anaesthetic mixture in SCBB had lowest opioid requirement in 1st 24 hours (Table- 4).

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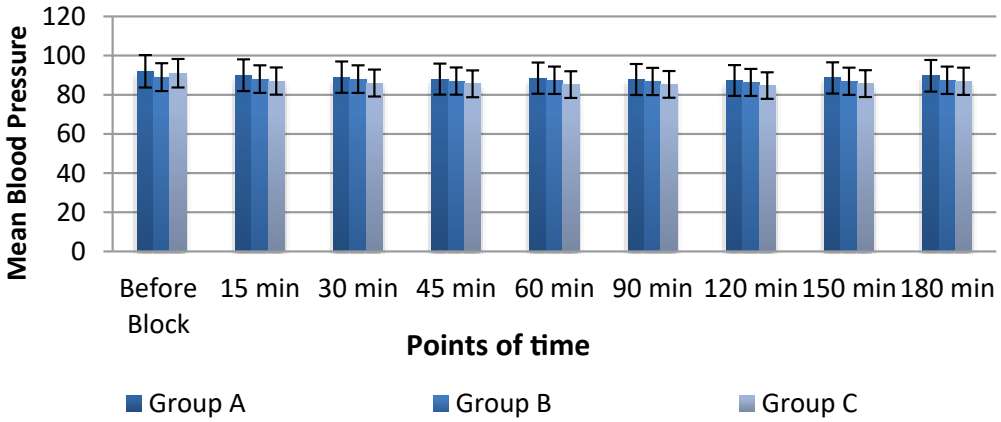

Figure 2: The mean blood pressure (mm of Hg) during peri-operative period among three groups

Table 2: Comparison the time onset of blocks and duration of blocks between the groups (N= 82)

Characters of Block (minutes)	Group A (n=27)	Group B (n=28)	Group C (n=27)	p value*		
				A versus B	B versus C	C versus A
The time for complete sensory block (minutes)	13.6±4.1	8.3±3.5	14.3±4.2	0.028ss	0.023ss	0.593
The time forcomplete motor block (Bromage score ≤2)(minutes)	16.7±4.6	11.4±3.9	18.7±4.3	0.033ss	0.021ss	0.437
The duration of sensory block (minutes)	312.9±24.8	586.6±29.7	954.3±38.5	0.012ss	0.009ss	0.005ss
Time for motor recovery(minutes)	278.4±18.7	534.8±23.5	916.7±29.8	0.015ss	0.0011ss	0.003ss

Values were expressed as Mean±SD. The p value was obtained by *Student t-test. ss= statistically significant

Table 3: Comparison of the visual analogue scale (VAS) scores between three groups during postoperative period (N= 82)

Time Interval	Group A (n=27)	Group B (n=28)	Group C (n=27)	p value*		
				A versus B	B versus C	C versus A
1st hours	1.3±0.6	1.2±0.5	0.9±0.08	0.683	0.462	0.438
2nd hours	2.1±0.9	1.4±0.4	1.1±0.3	0.419	0.636	0.401
4th hours	2.9±1.1	1.5±0.4	1.3±0.4	0.389	0.628	0.338
6th hours	5.7±1.5	1.9±0.6	1.2±0.3	0.005ss	0.426	0.002ss
8th hours	2.3±0.8	2.7±1.2	1.5±0.4	0.627	0.678	0.368
10th hours	2.5±0.9	5.8±1.4	1.4±0.6	0.008ss	0.003ss	0.358
12thhours	2.8±1.1	2.6±0.9	1.8±0.7	0.593	0.374	0.391
14th hours	**5.3±1.2**	**2.3±0.6**	**2.5±0.9**	**0.003ss**	**0.659**	**0.006ss**
16thhours	**2.3±0.7**	**2.4±0.7**	**5.2±1.3**	**0.348**	**0.008ss**	**0.007ss**
18th hours	2.6±1.1	5.5±1.5	2.9±0.7	0.002ss	0.005ss	0.653
20thhours	**5.4±1.2**	**2.8±1.2**	**2.4±0.8**	**0.009ss**	**0.538**	**0.006ss**
24th hours	2.2±0.8	2.4±0.9	2.3±0.6	0.626	0.639	0.645

Values were expressed as Mean±SD. * Student t-test was performed to compare the mean VAS scores of the groups. ss= statistically significant

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It was observed that during first six hours in postoperative period the mean Ramsay sedation scale (RSS) was higher in group B than group A and group C (Table- 5). That means patients receiving fentanyl as adjuvant during SCBB were more sedated than normal saline and dexamethasone. This might be due to fentanyl had sedation effects after systemic absorption. On the other side, RSS was low at 6th hours in group A (1.3±0.4), at 10th hours in group B (1.6±0.4) and at 16th hours in group C (1.4±0.3) (Table- 5). At these contemporary times VAS score was high in these group; that indicates patients were feeling moderate to severe pain during these contemporary times, so RSS was lower during these times (Table- 5).

In this study, no significant difference was observed in case of procedure related complications between three groups (Table- 6). The incidence of dyspnoea or chest discomfort was higher in group B (21.4%) than other groups (Table- 6). This might be systemic effects of fentanyl. Peri-operative complication like nausea (22.2%) and shivering (18.5%) were higher in group A than group B and group C (Table- 6). Other complication like itching was more in group B (25%) than group A and group C (Table- 6). All over peri-operative complications were less in group C than any other group. So, the patients receiving dexamethasone with local anesthesia mixture in SCBB had lowest perio-perative complications than patients who receiving fentanyl in SCBB (Table- 6).

Table 4: Comparison regression time of the block between the groups (n=82)

Characteristics	Group A (n=27)	Group B (n=28)	Group C (n=27)	p value*		
				A versus B	B versus C	C versus A
Time of first rescue analgesia (minutes)	321.7±23.4	597.8±25.3	947.6±34.2	0.013^{ss}	0.008^{ss}	0.003^{ss}
Total opioid requirement in 1st 24 hours (mg)	253.7±17.6	173.6±14.3	92.5±10.4	0.006^{ss}	0.017^{ss}	0.025^{ss}

Values were expressed as Mean±SD, *Student t-test was performed, ss= statistically significant

Table 5: Comparison of the Ramsay sedation scale (RSS) scores between three groups during postoperative period (N= 82)

Time Interval	Group A (n=27)	Group B (n=28)	Group C (n=27)	p value*		
				A versus B	B versus C	C versus A
1st hours	2.1±0.7	4.2±1.2	2.3±0.9	0.008^{ss}	0.011^{ss}	0.529
2nd hours	2.3±1.1	4.4±1.5	2.2±0.8	0.007^{ss}	0.0012^{ss}	0.541
4th hours	1.9±0.8	4.1±1.3	2.3±1.1	0.006^{ss}	0.0015^{ss}	0.563
6th hours	**1.3±0.4**	**3.9±1.1**	**2.2±0.8**	**0.008^{ss}**	**0.0021^{ss}**	**0.042^{ss}**
8th hours	3.3±1.1	2.8±1.2	2.5±0.6	0.028^{ss}	0.459	0.036^{ss}
10th hours	**2.9±0.8**	**1.6±0.4**	**2.4±0.5**	**0.024^{ss}**	**0.031^{ss}**	**0.618**
12thhours	2.5±0.7	2.8±0.9	2.2±0.6	0.643	0.583	0.541
14th hours	2.1±0.6	2.7±0.8	2.3±0.5	0.473	0.539	0.528
16thhours	**2.3±0.7**	**2.5±0.6**	**1.4±0.3**	**0.536**	**0.518**	**0.033^{ss}**
18th hours	2.7±1.1	2.5±0.9	2.8±0.8	0.472	0.537	0.563
20thhours	2.4±0.7	2.7±1.1	2.5±0.9	0.439	0.458	0.419
24th hours	2.3±0.8	2.5±1.1	2.2±0.7	0.645	0.628	0.671

Values were expressed as mean±SD, * Student t-test was performed to compare the mean RSS score of the groups, ss= statistically significant

Table 6: Peri-operative complications among the patients between three groups (N= 82)

Peri-operative Complications	Group A (n=27)	Group B (n=28)	Group C (n=27)	p value*		
				A versus B	B versus C	C versus A
Horner's syndrome	2(7.4%)	2(7.14%)	1(3.7%)	0.969	0.544	0.552
Dyspnoea or chest discomfort	4(14.8%)	6(21.4%)	3(11.1%)	0.525	0.301	0.685
Vascular puncture	2(7.4%)	3(10.7%)	2(7.4%)	0.669	0.669	1
Nausea	6(22.2%)	5(17.8%)	1(3.7%)	0.686	0.092	1
Itching	3(11.1%)	7(25%)	0	0.182	0.005	0.074
Shivering	5(18.5%)	3(10.7%)	1(3.7%)	0.418	0.08	0.083

Values were expressed as frequency and within parenthesis percentage (%), *Chi-squared test ($\chi 2$) was performed

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Discussion

Supraclavicular Brachial Plexus Block (SCBB) is one of the widely practiced regional anaesthesia techniques for upper limb surgeries [2]. Various adjuvants like- epinephrine, bicarbonate, opioids, ketamine, midazolam, clonidine, neostigmine, dexamethasone and dexmeditomidine have been added to local anaesthetics to prolong the block duration and reduce the post-operative analgesia [2, 15]. Epinephrine has been used for many years as an adjuvant to local anaesthesia (LA) for reducing the risk of anaesthetic toxicity by delaying systemic uptake of the LA and prolongation of sensory blockade [8, 9]. But there is some conflicting evidence demonstrates that epinephrine does not prolong duration of analgesia for long-acting local anesthetics like ropivacaine, bupivacaine [15]. This study was intended to evaluate the effectiveness of dexamethasone and fentanyl as an adjuvant for postoperative analgesia with lignocaine-adrenaline and bupivacaine for SCBB in patients underwent upper limb surgery. The mean(±SD) age of the study patients in group A, group B and group C were 39.7±7.4, 42.1±8.3 and 41.5±7.8 years respectively, with a male predominance in each group. In this study, time required for the complete sensory and the motor blocks were 8.3±3.5 minutes and 11.4±3.9 minutes respectively in group B that was more rapid than two other groups. This correlate with the study done by Hasan S *et al.* who achieved the onset of the sensory and the motor blocks at 7.60±3.711 minutes and 9.23±5.114 minutes respectively among patients receiving fentanyl as adjuvant in SCBB [16]. In a study, Ahmed *et al*. used 100 mg fentanyl in 40 ml of 0.25% of bupivacaine in the supraclavicular approach in paraesthesia technique and achieved the onset of the sensory and motor block at 8.9±2.9 minutes and 8.8±2.7 minutes respectively [17]. This current study demonstrated that there was no significant difference in case of the time required for complete sensory block (13.6±4.1 minutes versus 14.3±4.2 minutes) and the motor block (16.7±4.6 minutes versus18.7±4.3 minutes) in between group A and dexamethasone group (p>0.05). This finding was compared with similar previous studies [18, 19]. One related study observed that onset times of sensory and motor blocks were similar in the two groups [18]. While, Yaghoubi SI *et al.* had observed no significant differences in the onset time of sensory and motor blocks between fentanyl group and dexamethasone group [20]. In this study it was observed that the duration of sensory block (minutes) in group A was 312.9±24.8 minutes and time for motor recovery (minutes) was 278.4±18.7 minutes. But the other two groups showed more duration of sensory block and time for motor recovery. The time for first rescue analgesia (minutes) was also short in group A (321.7±23.4 minutes) compared to group B (597.8±25.3 minutes) and group C (947.6±34.2 minutes). Similar result was depicted in a comparative study carried out by Chavan and colleagues; they evaluate the analgesic efficacy and side effects of addition of fentanyl to local anaesthetics [21]. Their study revealed that mean duration of analgesia was extended (695±85 minutes) if fentanyl is added to local anesthetics without increasing the side effects, however onset time of analgesia was prolonged [21]. Kore *et al.* also observed that, the mean duration of sensory block was prolonged in dexamethasone group (18.05 ± 1.95 hours) as compared to fentanyl group (11.04 ± 1.54 hours) and control group (5.51 ± 1.36 hours). The duration of motor block was also found to be prolonged in dexamethasone group (16.15 ± 1.79 hours) than fentanyl group (7.73 ± 1.45 hours) in their study and the variation between the two groups was found to be statistically significant (p <0.05) [2]. Another previous study revealed that; the duration of analgesia was longer in dexamethasone group (19.00 ± 1.80 hours) than the fentanyl group (12.03 ± 1.54 hours), and the duration of motor block was also significantly prolonged in dexamethasone group than fentanyl group (18.93 ± 1.76 hours versus 11.73 ± 1.72 hours, p<0.05) [19]. In this study visual analogue scale (VAS) scores and Ramsay sedation scale (RSS) were assessed up to twenty four hours after surgery. The patients receiving dexamethasone with bupivacaine provided longer duration of analgesia than fentanyl ((947.6±34.2 minutes 597.8±25.3 minutes). The total opioid requirement in 1st 24 hours (mg) was higher in group A (253.7±17.6 mg) than group B (173.6±14.3mg) and group C (92.5±10.4 mg). That indicates, patients receiving dexamethasone with local anaesthetic mixture in SCBB had lowest opioid requirement (mg) in 1st 24 hours. While Zainab F *et al.* revealed a significantly longer duration of analgesia with fentanyl in supraclavicular brachial plexus block (p <0.001) [22]. However, Shende SY *et al.* observed the mean VAS score was low in dexamethasone group [23]. A couple of study correlated the postoperative VAS scores with our study [22, 23]. This current study demonstrated that patients receiving fentanyl in SCBB had higher RSS during first six hours in postoperative period than group A and group C. In this context, El-Feky EM *et al.* observed that sedation score was significantly higher at the 1st 4 hours in the fentanyl group than dexamethasone group [24]. While, sedation scores at the 6th and 12th hours were comparable between fentanyl and dexamethasone groups [24].

In this study there was no significant difference was observed in case of procedure related complication between three groups. The incidence of dyspnoea or chest discomfort was higher in group B (21.4%) than two other groups. Other complications like- nausea (22.2%) and shivering (18.5%) were higher in group A than group B and group C. Complication like- itching was more in group B (25%) than group A. All over peri-operative complications were less in group C than any other groups. Therefore, the patients were receiving dexamethasone with local anesthesia mixture in SCBB had lowest peri-operative complications than patients who receiving fentanyl in SCBB. Shende SY

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et al. documented that, peri-operative complications like-horner's syndrome and dyspnoea or chest discomfort had no statistically significant differences between the groups [23]. A study had showed postoperative vomiting (25%), itching (25%) and respiratory depression (32.1%) were significantly occurred in the fentanyl group compared to other groups [24]. These previous studies also had similarity with peri-operative complications of the patients with this current study [23, 24]. This current study observed that both fentanyl and dexamethasone are able to prolong the duration of sensory and motor block with local anaesthetic agent in supraclavicular brachial plexus block (SCBB). But dexamethasone could be a better alternative as it provides longer duration of analgesia, less analgesic (opioid) requirement (mg) in 1st 24 hours and reduced peri-operative complications. Therefore further studies may need to evaluate the optimal dose and long term safety of dexamethasone in supraclavicular brachial plexus block.

Conclusion

This study concluded that addition of 10 mg dexamethasone with local anaesthetic mixture in supraclavicular brachial plexus block (SCBB) prolongs the duration of sensory and motor blocks, reduces the requirement of rescue analgesics for 1st 24 hours and decreases complications during peri-operative period than 100 µg fentanyl with local anaesthetic mixture.

Limitations of the study

It was a single centre study with a relatively small sample size. In this study we did not able to evaluate the plasma concentration of adrenaline, dexamethasone or fentanyl due lack of available facilities.

Conflicts of interest

There are no conflicts of interest regarding this publication.

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