

Original Article

Comparison of Fentanyl and Dexamethasone as an Adjuvant to Bupivacain and Lignocaine in Supraclavicular Brachialplexus Block for Upper Limb Surgeries

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Abstract

Background and Aims: The role of fentanyl as an adjuvant to regional blocks to hasten the onset of the local anesthetics or prolong their duration of action is proven. But recently, dexamethasone has been studied as an adjuvant to local anaesthetic in peripheral nerve block. The efficacy of dexamethasone compared to fentanyl as an adjuvant is not known. We aimed to compare the efficacy of dexamethasone versus fentanyl as an adjuvant to 0.5% Bupivacain with 2% lignocaine in infraclavicular brachial plexus block for upper limb surgeries.

Material And Methods: Sixty American Society of Anaesthesiologists-I and II patients aged 18-65 years scheduled for upper limb surgery were randomized to two groups .

Group A (n = 30) received 0.25% Bupivacaine 28 ml+ 2% Lignocaine 10 ml+ Fentanyl 2 ml(100µgm) = total 40 ml & Group B (n = 30) received 0.25 % Bupivacaine 28 ml+ 2% Lignocaine 10 ml+ Dexamethasone 2 ml(10mg) = total 40 ml .

The time to onset and peak effect, duration of the block (sensory and motor) time of first analgesic requirement were recorded. Chi-square and ANOVA test were used for categorical and continuous variables respectively P < 0.05 was considered significant.

Results: The duration of sensory and motor block in group A and B were 520 .0± 33 min, 235.2 ± 34.8 min and 710.0 ± 66.4 min and 312.3 ± 40.9 min respectively. There was significant prolongation of sensory and motor block in group B as compared to group A (P < 0.5). Time to first analgesic requirement was significantly more in groups B as compared with group A (P < 0.5). Clinically significant complications were absent.

Conclusions: We conclude that dexamethasone is more efficacious than fentanyl as an adjuvant to 0.5% Bupivacain with 2% lignocaine in brachial plexus blocks.

Key words: fentanyl, dexamethasone, brachial plexus block

(JBSA 2016; 29(2): 62-66)

Introduction:

Peripheral nerve blocks have assumed a prominent role in modern anaesthetic practice as they provide ideal operative condition without any sedation & systemic haemodynamic effect¹.

Brachial plexus block is a popular and widely employed regional nerve block of the upper extremity with advances in the field of surgery¹.

Surgical procedures have become more complex and the operating time has increased manifold & also up to post operative period which is the period of severe intolerable pain requiring attention. So there is need of extended analgesia without any side effects in the process of achieving this goal.²

To achieve this many drugs have been used as adjunct to local anesthetic¹. Drugs like morphine,

pethidine, fentanyl, clonidine, dexamethasone, dexmedetomidine, buterophenol, buprenorphine are commonly used along with local anaesthetic for this purpose³. But they have some side effects like heavy sedation, psychomotor, psychosomatic effect etc. However, their use is limited because of side effects like deep sedation, pruritus, respiratory depression, psychomimetic effects. Drugs with minimal of these side effect are always looked for. In addition of Fentanyl (2 µgm/kg) to local anaesthetic solution is useful to extend the rapid onset of analgesia dense block and extend the period of analgesia by some authors but has some side effects like respiratory depression and pruritus. Recently dexamethasone has been studied as an adjuvant to local anaesthetic in peripheral nerve block.^{4,5}

Steroids have nerve block prolonging effect. They produce analgesia by blocking transmission of nociceptive myelinated C-fibre and suppressing ectopic neural discharge. It has been reported that dexamethasone with local anaesthetic in brachial plexus block produce prolong duration of action of local anaesthetic without sedation and respiratory depression.

On the basis of studies of related literature and discussion made above, it may be thought that dexamethasone in local anaesthetic is better alternative to fentanyl for brachial plexus block with minimal side effects.

In this study we have evaluate the quality, onset, duration of anaesthetic effect of dexamethasone versus fentanyl as an adjuvant to 0.5% bupivacain with 2% lignocaine in supraclavicular brachial plexus block for upper limb surgeries.

Methodology:

After obtaining approval from hospital ethical committee in BIRDEM General Hospital, about 60 patients were enrolled in the study. The study population included patient of either sex, ASA grade I & II in the range of 18-65 years.

All patients were posted for upper extremity surgery below the shoulder joint and received brachial plexus block by supraclavicular approach. The written informed consent and assessment of all the selected patient were taken preoperatively.

In group A- patient received 0.25 ml Bupivacaine 28 ml+ 2% Lignocaine 10 ml+ fentanyl 2 ml(100µgm) = total 40 ml.

In group B- patient received 0.25 % Bupivacaine 28 ml + 2% Lignocaine 10 ml + 2 ml (10mg) dexamethasone = total 40 ml.

Patient refusal, coagulopathy or receiving anticoagulant therapy, history of allergy to study drugs, history of hypertension, peripheral neuropathy, inadequate block or any unsuitable local condition were excluded from this study.

On arrival of patient at operating room base line pulse rate, blood pressure, respiratory rate and pain score were recorded. A peripheral IV line was established in the non-operated hand. Patients were hydrated with IV Hartman solution 500 ml at rate of 30 drops/min with all aseptic precaution, supraclavicular brachial plexus block were established using of paresthesia technique in the proposed operated hand.

Patients were on supine position, head turned to the opposite side and arm placed medially towards the body, 2ml of 1% Lignocaine was used for infiltration at mid-clavicular line half inch above the clavicle. Supraclavicular brachial plexus block done with all aseptic precaution with a 24-gauge needle, immediately lateral to subclavian artery. After obtaining parathesia drug were administered as follows: Group A (control) : 0.25% bupivacain 28 ml + 2% lignocain 10 ml + fentanyl 2ml (100 µgm) Group B (study) : 0.25% bupivacain 28 ml + 2% lignocain 10 ml + dexamethasone 2ml (10 mg).The time of onset of block were noted. The onset of sensory block was assessed with application of cold spirit swab and response to pin prick by blank needle in different areas innervated by radial, ulnar, median, musculocutaneous nerves at 5 min interval. The time of onset of complete sensory block was noted.

The motor block was assessed every 5 min by asking the patients to raise their ipsilateral hand and move their fingers. When patients could not move fingers or raise hand, it was considered as complete motor block (modified bromage scale), the time was noted. The duration of analgesia was noted according to 0-10 visual analog scale (VAS) for pain at every hour till 10 hrs then to 2 hrs for 24 hrs. Pulse rate, blood pressure, respiratory rate were monitored every 5 minutes till the patient shifted from operating table. Patients were watched for signs of pneumothorax, like tachypnea and respiratory distress. Frequency of sedation,

nausea, vomiting and convulsion were recorded. All data were recorded on data sheet, after collection, data were checked meticulously and then compiled, analyzed for statistical significance using mean standard analyzed for statistical significance using mean standard deviation, independent student 't' test, ANOVA, chi-squared

test or Fisher's exact test as appropriate using SPSS version 12.0 for windows. P-value <0.05 was regarded as significant.

Results:

There were no significant differences between the Groups respected to age, ASA physical status & weight.

Table I Demographic characteristics of Group-A and Group-B

Demographic variables	Group A(n=30)	Group B(n=30)	P value
Age (years)Mean±SD	33.1±13.2	35.5±11.2	0.256
Sex			
Male	23(76.6)	21(70.0)	0.559
Female	7(32.3)	9(30.0)	
Weight (kg)	66.2±10.2	69.3±6.1	0.160
ASA physical status			
I	20(66.66%)	18 (60%)	0.629
II	10(33.33%)	12(40%)	0.498

The time of onset of sensory blockade was earlier in group –A than Group-B. The duration of sensory and motor blockade in group-B were significantly longer (610.0 ± 66.4 & 312.3 ± 40.9) than those in group-a (415.5 ± 33.3 & 235.2 ± 34.8).

Table II Duration and onset of sensory& motor blockade between Group-A and Group-B

Timing of anesthesia	Group-A (n=30)	Group –B(n=30)	P- value
Onset of sensory block	09.9 ± 2.9	12.9 ± 2.7	<0.031
Duration of sensory block (minutes)*	520.0 ± 33	710.0 ± 66.4	<0.001
Onset of Motor block (minutes)*	12.3 ± 2.7	15.8 ± 2.1	0.026
Duration of Motor block(minutes)*	235.2 ± 34.8	312.3 ± 40.9	<0.001

There was no significant differences between groups in total duration of surgery But duration of analgesia was significantly longer in group-B than group –A

Table V: Total duration of Surgery & analgesia

Observations	Group-A	Group-B	P-value
Total duration of Surgery (min)	178 ± 28	185 ± 26	>0.05
Total duration of analgesia (min)	620 ± 78	805 ± 85	<0.01

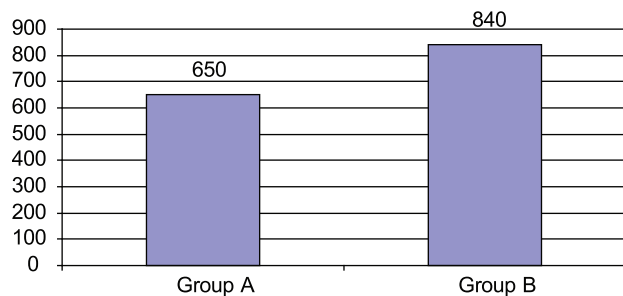


Fig.-1 Time of first analgesics

Discussion

Adjuvant improves analgesia, reduces systemic side effects and total dose of local anesthetics. Opioids like fentanyl, morphine, pethidine, non-opioid like dexamethasone, midazolam, and neostigmine have been studied as adjuvant to local anaesthetics. However, their use is limited because of side effects like sedation, hypotension, purities, and sympatho-mimetic effects. Fentanyl-bupivacaine combination used in spinal, epidural and in brachial plexus block. Their use has established because onset is rapid, anaesthesia more complete and prolonged analgesia⁶.

Recently, dexamethasone has been studied as an adjuvant to local anesthetic in peripheral nerve block^{4,5}. Steroids have nerve block prolonging effects. They produce analgesia by blocking transmission of nociceptive myelinated c-fibers and suppressing ectopic neuronal discharge. They might bring about this effect by altering the function of potassium channels in the excitable cells. Thus dexamethasone was selected as an adjuvant to local anesthetics in brachial plexus block in our study because it has been reported to prolong duration of action of local anesthetics and respiratory depression is not a major problem. Addition of dexamethasone with bupivacaine in the brachial plexus block prolongs anaesthesia, analgesia and reduces side effects⁷. In this study fentanyl or dexamethasone was used as adjuvant in bupivacaine. Onset as well as duration of sensory and motor block were recorded along with quality. In Group- B (dexamethasone - bupivacaine) the duration of sensory and motor block were significantly longer than that of Group-A. Several studies have shown that addition 4-8 mg of dexamethasone to local anesthetics effectively and significantly prolongs the duration of analgesia.

In a study by Castillo J, Curley J, Hotz J et al a prolonged percutaneous block of sciatic nerve in rat using bupivacaine – dexamethasone microspheres was demonstrated⁸.

The intensity of postoperative pain measured on VAS (visual analog scale) show that the subjects of Group-B had no pain from 60 minutes to 620 minutes period. Then after it began to rise and reaches its peak at 840 minutes, when an analgesic dose was needed to reduce the intensity of pain. No pain was observed in Group-A at 60 minutes thereafter it increased insidiously 3 cm at 440 minutes interval, 6 cm at 620 minutes interval which then sharply decreased 2 cm at 720 minutes following an analgesic dose.

Regarding duration of analgesia, in our study it was demonstrated that mean duration of analgesia was significantly longer in Group-B (805±85 min) than that produced by Group-A (620±78) (P<0.001) which was significant.

Pathak et al (2012) done a study to compare the quality and duration of analgesia in two groups, group-1 (received 1.5% adrenalized lignocain (20ml) and 0.5% bupivacaine (16ml) + dexamethasone 8mg (2ml)) and group-2 (received 1.5% adrenalized lignocain (20ml) and 0.5% bupivacaine (16ml) + 0.9% normal saline (2ml)). Analgesia was prolonged with dexamethasone, (834 min VS 276 min) and superior to that of epinephrine (P<0.001)⁹.

In our study dexamethasone was found to increase the duration of sensory and motor block more than that of fentanyl. Movafegh *et al.* found significantly increased duration of sensory and motor block when dexamethasone was added to lignocaine as compared with fentanyl lignocain group¹⁰.

Clinically significant complications such as pneumothorax, respiratory dysfunction, Horner's syndrome, recurrent laryngeal nerve block and vascular punctures etc were absent in our study.

Dexamethasone significantly prolonged the time for first analgesic requirement as compared with fentanyl bupivacain-lignocaine. The total analgesic consumption reduced in the dexamethasone groups than fentanyl groups at first 24 h. Dexamethasone improved the postoperative analgesic over fentanyl.

From the discussion so far, it is evident that dexamethasone–bupivacaine combination is more effective than fentanyl-bupivacaine in reducing intensity of postoperative pain.

Conclusion

So concluded that dexamethasone as adjuvant of local anesthetic for supraclavicular brachial plexus block markedly improve intra-operative quality of anaesthesia, significantly prolongs the duration of postoperative analgesia and is a remarkably safe and cost effective method of providing post operative analgesia.

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