



## BRACHIAL PLEXUS BLOCK; THE EFFECTIVENESS OF DEXAMETHASONE WHEN ADDED TO PRILOCAINE, FOR SENSORY AND MOTOR BLOCKADE, A CASE CONTROL STUDY.

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**ABSTRACT... Objectives:** The aim of our study is to find out the efficacy of dexamethasone (8mg) on prolonging the duration of motor and sensory blockade as used in brachial plexus block required for forearm and hand surgeries. **Study Design:** Prospective randomized double blind trial. **Period:** April 2013 to May 2014, for a period of 14 months. **Setting:** Tertiary care hospital in Karachi Pakistan. **Method:** The study population consisted of 42 patients belonging to ASA classification, grades I and II, who underwent elective surgical procedures involving the forearm and hand. The patients were divided in to three groups, group A consisted of patients who were given 2% of prilocaine at 5mg per kg of body weight, group B consisted of patients who were given 2% of prilocaine with dexamethasone (8mg as 2ml) at group C consisted of patients who were given 0.5% of levobupivacaine at 1.5mg per kg of body weight. The time duration and onset of sensory and motor blockade was duly noted for all the three groups. Data was analyzed using SPSS version 20. **Results:** The time of onset of motor and sensory block in group A and B, were very similar, there was a difference of longer duration was duly noted in group C, which was statistically significant ( $p < 0.001$ ). In terms of the duration of block, a statistically significant difference was found when compared in the three groups ( $p < 0.001$ ). The duration of sensory and motor blockade was longer in Group C when compared to the other two groups, and they were found to be longer in group B when compared with group A ( $p < 0.001$ ). Side effects were not found in the study population due to small number of patients evaluated. **Conclusion:** According to our study the addition of dexamethasone to the prilocaine used in hand and forearm surgeries resulted in increased duration of the sensory and motor blockade achieved. While levobupivacaine was found to be a very potent anesthetic when used locally for post op analgesia requirements and during long procedures.

**Key words:** Brachial plexus block, dexamethasone, prilocaine, levobupivacaine, hand and forearm surgeries.

**ABBREVIATIONS:** ASA: American Society of Anesthesiologists, post op= post-operative

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## INTRODUCTION

For various surgical and orthopedic procedures involving the forearm and hand the brachial plexus block is a safe and effected method which is well tolerated by patients for the motor and sensory blockade.<sup>1</sup> Use of various drugs have been done, to provide a longer duration of efficacy in lower doses, to improve the quality of analgesia and anesthesia provided these drugs included but not limited to magnesium, Tramadol, parecoxib, buprenorphine, fentanyl, sodium bicarbonate, clonidine, epinephrine, dexamethasone and

dexmedetomidine.<sup>2-14</sup> Glucocorticoids due to their vasoconstrictor and anti-inflammatory effects, were used in the treatment of chronic pain, as tested in some animal and human studies. According to some recent studies addition of glucocorticoids in local anesthetics provided longer duration of anesthesia, but studies regarding use of glucocorticoids for local anesthetics as used in peripheral blocks is limited<sup>15,16</sup> A drug cortexolone in a glucocorticoids antagonist and inhibits the blockade prolonging effects of glucocorticoids which arises from their potential as an anti-

inflammatory agent. Dexamethasone used alone does not produce block.<sup>17</sup> In some human and animal studies dexamethasone when combined to local anesthetics produced a prolonged axillary block. In our study we have hypothesized that the use of dexamethasone and prilocaine would result in a longer duration of action of the block. Also we set to find out the effects of prilocaine alone, prilocaine plus dexamethasone and levobupivacaine on the duration of sensory and motor blockade in axillary nerve block, as tested with the use of a peripheral nerve stimulator.

### MATERIALS AND METHODS

The type of study is prospective randomized double blind trial, as conducted from April 2013 to May 2014, for a period of 14 months at a tertiary care hospital in Karachi Pakistan. The study population consisted of 42 patients belonging to ASA classification, grades I and II, who underwent elective surgical procedures involving the forearm and hand. The exclusion criteria was all the patients who had severe co morbidities like hepatic, cardiovascular or renal involvement, pregnant women, patients who refused to participate in the study, the patients with block failure and those patients for whom general anesthesia had to be used. The patients were divided in to three groups, group A consisted of patients who were given 2% of prilocaine at 5mg per kg of body weight, group B consisted of patients who were given 2% of prilocaine with dexamethasone (8mg as 2ml) at group C consisted of patients who were given 0.5% of levobupivacaine at 1.5mg per kg of body weight. Normal saline was added to make the drugs volume to 40cc, and the block was applied through axillary approach. An anesthesiologist who was not involved in the surgical procedure or the data collection process, prepared the mixtures of drugs, and labeled them using random number generator software.

No premedication was done, standard monitoring was done in the operation theatre, a 20 gauge cannula was used to deliver fluids in the opposite arm, The arm was put in position (90 degrees abduction of the arm and 90 degrees flexion of the forearm) and 1ml lidocaine was given via

injection, after the operating site was cleaned, and axillary artery was found via palpation. A nerve stimulator was used to locate the brachial plexus, the initial current was set at 2 amperes, and then decreased gradually, the position was deemed as suitable when the current of less than 0.5 amperes elicited a response in the nerves (twitching of the associated muscle fibers) the local anesthetic solution, was then injected in 2ml increments. Negative aspiration for blood, was used to confirm that the needle is not in a vessel. Intercostobrachial nerve block was also established to relieve any pain caused due to the tourniquet. A single anesthesiologist performed the procedure for all the patients with same technique. The patient's baseline vitals were noted and also the vitals after the injection of the solution was done. A pin prick test was used to record the sensory block, the point 0 was considered when normal sensation was intact, 1 was when loss of sensation of pin prick, 2 was loss of sensation of touch. The motor block was assessed using the bromage scale, 0 being no movement, 1 being finger movement, 2 being flexion of the wrist joint, 3 being flexion of the elbow joint. The values were noted at 5min interval for 30min then 30min interval post op, till sensations returned. The time of onset was considered, as the duration that took from first needle injection to loss of sensation and complete paralysis. And the time duration of returning the sensation was when sensation were felt, and first post op pain episode was noted. Motor block time, was from time onset of complete paralysis to return of full motion. Visual analog scale was used for measurement of subjective pain sensation. Diclofenac sodium was given for pain management post op, as 1mg per kg of body weight, and associated side effects of the agents used for block was also noted, such as nausea, vomiting, and cardiovascular complications. Data was analyzed using SPSS version 20. Frequencies, percentages and standard deviations were used for constant quantitative data analysis. One way analysis of variance was used to compute the data consisting of constant variable with independent and repeated measurements, that show a normal distribution. Kruskal Wallis and Friedman tests were used to analyze independent and repeated

data that failed to show normal distribution. Chi square test was done for comparative data analysis, and a p value of less than 0.05 was considered to be statistically significant.

## RESULTS

Demographic data did not show any significant difference in the three groups (Table-I), the baseline readings of blood pressures recorded as control and also during the operation were found to have no significant difference. ( $p > 0.05$ ), The various times for onset of motor and sensory blockade achieved in the three groups of patients

are noted in the table, while the time in group A and B, were very similar there was a difference of longer duration was duly noted in group C, which was statistically significant ( $p < 0.001$ ). In terms of the duration of block, a statistically significant difference was found when compared in the three groups ( $p < 0.001$ ). The duration of sensory and motor blockade was longer in Group C when compared to the other two groups, and they were found to be longer in group B when compared with group A ( $p < 0.001$ ). Side effects were not found in the study population due to small number of patients evaluated.

Factors	Group A	Group B	Group C
Age	40.5 +/- 9.4	40.6 +/- 9.1	39.9 +/- 8.4
Gender	6/8	7/7	4/10
Onset time of motor block ( mins )	5 (5-10)	5 (5-10)	15 (15-20)*
Onset time of sensory block ( mins )	5 (5-10)	5 (5-10)	15 (10-15)*
Time duration of sensory block ( mins ) given as SD ( $p < 0.001$ )	215.6 +/- 35.2	380 +/- 50.1	503.1 +/- 63.9
Time duration of motor block ( mins )	134 (119-179)	300(264-349)*	380(312-401)*

**Table-I. Demographics and different variables for each group of patients.**  
Kruskal-Wallis one way variance analysis. Data are given as median, 25% to 75%. ( $p < 0.001$ \*)

## DISCUSSION

An ideal agent for sensory and motor block during operative procedures, has the properties of a rapid onset of blockade, earlier time of motor block recovery than sensory block, and the patients ability to move the limb when under the analgesic effect<sup>18</sup> Anesthesiologists have used various agents to help achieve this effect. According to some studies<sup>9</sup> addition of dexamethasone in lidocaine significantly prolonged the durations of sensory and motor blockade achieved, while it did not affect the time of onset of sensory and motor blockade. Addition of dexamethasone to mepivacaine, prolonged the analgesia duration, but had no effect on onset time, in patients undergoing hand and forearm surgeries.<sup>19</sup> According to another study, dexamethasone when added to bupivacaine prolonged the duration of sensory and motor blockade when used in interscalene brachial plexus block. Also the pain was reduced in dexamethasone group in the first 24 hours but similar at the 48 hour point post op, when compared with just bupivacaine.<sup>20</sup> A different study

concluded that although the analgesic effect of dexamethasone is not understood to its full extent, it showed improved analgesia post op when dexamethasone as added to levobupivacaine in brachial plexus block. The effect is supposed to be due to dexamethasone's effects on peripheral nerve fibres<sup>21,22</sup> however it may reduce blood flow due to vasoconstrictive effects thereby reducing absorption of the anesthetic agent.<sup>9</sup> A study concluded that the effect of analgesia is due to reduced synthesis of inflammatory mediators.<sup>23</sup> It was reported that 8mg of dexamethasone when added to lidocaine produced the effects of longer duration of block with no effect on onset, however it is not suited for all the patients, specially for those prone to hyperglycemia and infection as in diabetes<sup>9</sup>, our study produced similar results, and we did not observe any complications which may affect the use of dexamethasone, such as hyperglycemia and infections as noted in previous studies. Dexamethasone added to prilocaine as compared to prilocaine alone was superior as it prolonged the duration of action, and is a very

good option for axillary brachial plexus block. As for levobupivacaine, the onset time was longer as compared to prilocaine but it reduced the use of post op analgesia use, due to its longer sensory blockade.

## CONCLUSION

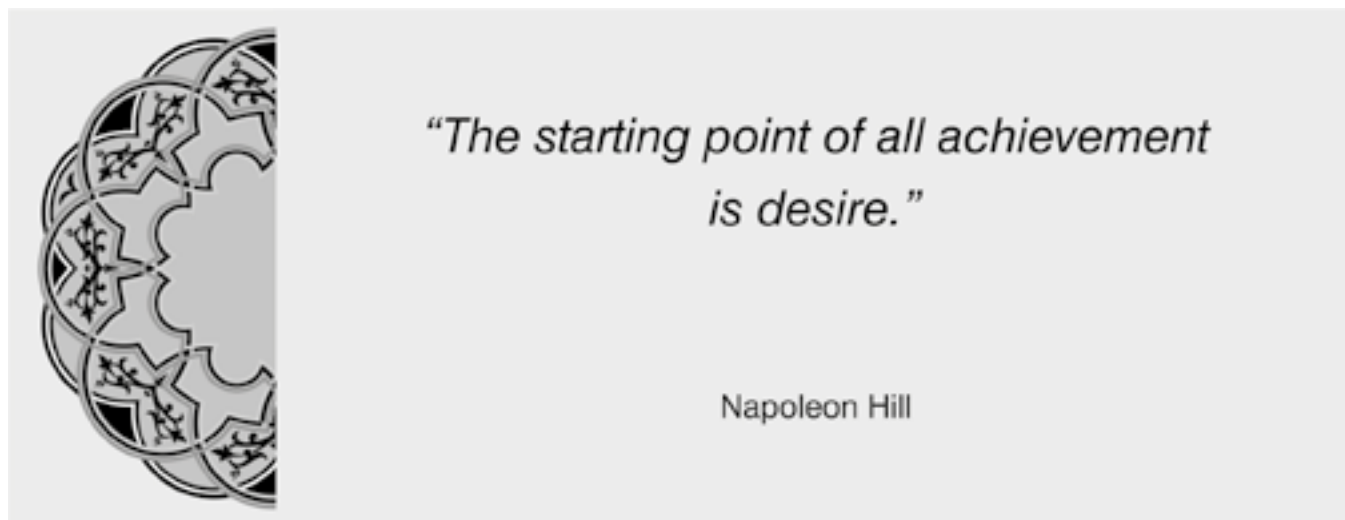
According to our study the addition of dexamethasone to the prilocaine used in hand and forearm surgeries resulted in increased duration of the sensory and motor blockade achieved. While levobupivacaine was found to be a very potent anesthetic when used locally for post op analgesia requirements and during long procedures.

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