The Effect of Adding Dexmedetomidine to Levobupivacaine in Scalp Nerves Block on Duration of Analgesia Postoperatively in Supratentorial Craniotomy Operations

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Abstract

Background: In this study we compared the benefits of adding the new \(\alpha\)2 adrenergic blocker dexmedetomidine to levobupivacaine in SNB for patients undergoing craniotomy for supratentorial tumors as regarding effect on duration of postoperative analgesia post operative heart rate and mean arterial blood pressure.

Patients and Methods: 60 patients were enrolled in the study randomly divided in 2 equal groups, one received SNB with levobupivacaine L, and the other group received SNB with levobupivacaine plus dexmedetomidine LD. Postoperative pain assessment was done after 5 minutes 4 hours, 8 hours, 16 hours and 24 hours of extubation. In the postoperative ICU using Visual Analogue Scale (VAS). Heart rate and mean arterial blood pressure has been recorded at 5 minute after extubationn and at 4, 8,16, 24 hours post extubation.

Results: Patients in Group LD had significantly lower HR and MAP and longer duration in analgesia than Group L in postoperative period.

Conclusion: We found that addition of dexmedetomidine to levobupivacaine in scalp nerve block increase duration of analgesia and gives better control of hemodynamic measurements postoperatively.

Key Words: Supratentorial craniotomies – Levobupivacaine – Scalp block – Dexmedetomidine – Analgesia postcraniotomy.

Introduction

APPROXIMATELY 60% of the patients experience moderate to severe pain after craniotomy operations. As a result of inadequate analgesic therapies, patients continue to endure pain (often severe) especially in the first postoperative hour and extends up to second postoperative day [1].

Traditional pain control drugs carry high risk on craniotomy patients as opiates may be accompanied by excessive sedation which mask the new onset neurological deficits and disturb the neurological response monitoring or depressed respiration leading to hypercarbia which increases cerebral blood volume and consequently raise the Intracranial Pressures (ICP) [2]. And NSAIDs inhibit platelet aggregation thereby increasing the bleeding time, the risk of postoperative bleeding persists. Moreover in the postoperative period, hypovolemia or vasoconstrictor therapy might follow craniotomy. Here the renal blood flow becomes "prostaglandin dependant" [3].

So SNB is a suitable method of analgesia in craniotomy operations as it gives deep analgesia that starts intraoperativly and lasts many hours after awakening of patient [4].

There are many methods to increase duration and quality of analgesia of SNB by using local anesthetics which have longer duration as bubi-vacaine instead of lidocaine, and using new local anesthetics which allow us to give larger volume and concentration as levobupivacaine and used various drugs in combination of local anesthetics with the best is \(\alpha\)2 adrenergic agonists.

\(\alpha\)2-AR agonists acts by enhancing local anesthetic effectiveness and prolong its duration by causing vasoconstriction around the site of injection (resulting in a delay of the absorption of local anesthetic) and direct interruption on peripheral nerve action [4]. It also suppresses and reduces pain transmission/conduction in spinal cord.

Dexmedetomidine, a potent \(\alpha\)2 adrenoceptor agonist that resulted in significant opioid sparing
The Effect of Adding Dexmedetomidine to Levobupivacaine in Scalp Nerves Block

effects as well as a decrease in inhalational anaesthetic requirements [4].

In various animal studies, dexmedetomidine has been reported to enhance sensory and motor blockade along with increased duration of analgesia [5-8]. In humans, dexmedetomidine has also shown to prolong the duration of block and post operative analgesia when added to local anaesthetic in various regional blocks [9-12].

Patients and Methods

This study was done in the Neurosurgical Theater in Kasr El-Aini Hospital during year 2016 including 60 patients suffering from supratentorial brain tumour after obtaining informed written consent from the patients and approval of the Ethical and Scientific Committee of Anesthesia Department in Cairo University.

Inclusion criteria were age between (20-60 years old), ASA: I & II of both sexes males and females.

Exclusion criteria: Were preoperative and suspected postoperative disturbed conscious level (Glasgow Coma Scale <14), incision extending beyond areas covered with scalp nerve block, uncontrolled hypertension, proven or suspected allergy to local anesthetics, anti-platelets treatment or coagulopathies and any complications during procedure as massive intracranial hemorrhage.

Study groups: The patients were randomly allocated into two equal groups each one includes 30 patients:

Group L received skull block bilaterally with levobupivacaine 0.5% (not more than 3mg/kg) with a total volume 36ml.

Group LD received skull block bilaterally with levobupivacaine 0.5% plus dexmedetomidine 1.5 g/g/kg of the same previous volume. Scalp nerve block has done to the following nerves:

- **Auriculotemporal nerve:** Was blocked by injecting 3ml of local anesthetic solution 1.5cm anterior to the ear at the level of the tragus.
- **Postauricular branches of the great auricular nerve:** Were blocked by injecting 3ml of local anesthetic solution between skin and bone, 1.5cm posterior to the ear at the level of the tragus.
- **Greater, lesser and least occipital nerves:** Were blocked by injecting 6ml of local anesthetic in a band like extension from posterior occipital protuberance to immediately behind the ear.
- **The subcutaneous tissue of the anterior temporal region:** was blocked with 3ml of local anesthetic forming a bridge between the area already anesthetized around the zygomatic arch to the supraorbital ridge, and into the pterional area.
- **The dura:** Was anesthetized with gauze soaked with lidocaine 1% without adrenaline placed over the dura for 5 minutes.

After extubation data was obtained only from patients who were oriented with regard to person, place, and time and with a Glasgow coma score of at least 14 (they would open their eyes to speech) will be considered for statistical analysis.

**Measured variables:**

Postoperative pain assessment was done after 5 minutes 4 hours, 8 hours, 16 hours and 24 hours of extubation. In the postoperative ICU using Visual Analogue Scale (VAS). Pain score with a 10 VAS (where 0 is defined as no pain at all and 10 as the worst possible pain) recorded by the ICU resident who was blinded to the study group; if VAS was more than 5, a rescue dose of paracetamol 1 gm +/- ketolac 30mg was given intravenously.

**Haemodynamics:** Heart rate and mean arterial blood pressure has been recorded at 5 minute after extubation and at 4, 8, 16, 24 hours post extubation.
Results

60 patients were enrolled in this study at Cairo University Hospital Neurosurgical Operative theatre. Patients’ characteristics including age, and gender (demographic data) are demonstrated in (Table 3). There was no significant difference in the demographic data between two groups of the study.

The age of the patients in Group L ranged from 25 to 60 years with mean age (in years) was 44.4 ± 10, while in Group LD ranged from 25 to 60 years with mean age was 41.3 ± 9.3.

The gender of patients in Group L was 18 (60%) male to 12 (40%) female while in Group LD was 22 (73%) male to 8 (26%) female.

Regarding heart rate and mean arterial blood pressure of two groups are presented as mean ± SD there is significant difference.

Regarding heart rate and mean arterial blood pressure of two groups are presented as mean ± SD. There is significant difference between two groups. (Tables 2,3).

Regarding visual analogue score, there was no significant difference between two groups at post-operative times five minutes, four hours and eight hours. There is significant difference at 16h post-operative and 24h postoperative (Table 4) and Fig. (1).

Table (1): Patient demographic data (n=60) expressed as mean ± SD or ratio.

<table>
<thead>
<tr>
<th></th>
<th>Levobupivacaine group (A) (n=30)</th>
<th>Levobupivacaine &amp; dex group (B) (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (male/female)</td>
<td>18/12</td>
<td>22/8</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>44.4±10</td>
<td>41.3±9.3</td>
</tr>
</tbody>
</table>

Table (2): Mean ± SD of heart rate for the two groups.

<table>
<thead>
<tr>
<th></th>
<th>Levobupivacaine group (A) (n=30)</th>
<th>Levobupivacaine &amp; dex group (B) (n=30)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>88</td>
<td>83.13</td>
<td>±6.57</td>
</tr>
<tr>
<td>T2</td>
<td>86.7</td>
<td>77.13</td>
<td>6.88</td>
</tr>
<tr>
<td>T3</td>
<td>87.7</td>
<td>80.73</td>
<td>6.97</td>
</tr>
<tr>
<td>T4</td>
<td>94.2</td>
<td>84.1</td>
<td>14.31</td>
</tr>
<tr>
<td>T5</td>
<td>105.6</td>
<td>87.27</td>
<td>14.45</td>
</tr>
</tbody>
</table>

Table (3): Mean ± SD of mean arterial blood pressure for the two groups.

<table>
<thead>
<tr>
<th></th>
<th>Levobupivacaine group (A) (n=30)</th>
<th>Levobupivacaine &amp; dex group (B) (n=30)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>89.4</td>
<td>84.97</td>
<td>±7.77</td>
</tr>
<tr>
<td>T2</td>
<td>85.7</td>
<td>79.5</td>
<td>9.74</td>
</tr>
<tr>
<td>T3</td>
<td>83.1</td>
<td>74.93</td>
<td>13.29</td>
</tr>
<tr>
<td>T4</td>
<td>94.8</td>
<td>80.53</td>
<td>15</td>
</tr>
<tr>
<td>T5</td>
<td>99</td>
<td>87.6</td>
<td>17.2</td>
</tr>
</tbody>
</table>

T1: 5 minute after extubation. T2: 4 hours after extubation. T3: 8 hours after extubation. T4: 16 hours after extubation. T5: 24 hours after extubation. *: Significance difference.

Table (4): Mean ± SD of mean arterial blood pressure for the two groups.

<table>
<thead>
<tr>
<th></th>
<th>LEVO group (A) (n=25)</th>
<th>LEVO, dex group (B) (n=25)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>1/(1-2)</td>
<td>1/(1-2)</td>
<td>0.783</td>
</tr>
<tr>
<td>Time 2</td>
<td>2/(1-3)</td>
<td>2/(1-3)</td>
<td>0.246</td>
</tr>
<tr>
<td>Time 3</td>
<td>2/(2-4)</td>
<td>3/(2-4)</td>
<td>0.581</td>
</tr>
<tr>
<td>Time 4</td>
<td>5/(3-5)</td>
<td>3 */(2-4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Time 5</td>
<td>5/(4-5)</td>
<td>4*/(3-5)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

T1: 5 minute after extubation. T2: 4 hours after extubation. T3: 8 hours after extubation. T4: 16 hours after extubation. T5: 24 hours after extubation. *: Significant difference between the median VAS of the two groups with p-value <0.001.

Fig. (1): Median and range of VAS for the two groups.

Discussion

Regarding postoperative pain, our results showed that there was no significant difference between two patient Groups L and LD at postoperative times five minutes, four hours and eight hours, but at times 16 and 24 hours there is significant difference between the median VAS of the two groups with p-value <0.001. Patients in Group L require 1gm IV rescue dose of paracetamol maximally before completing 16 hour postoperative while those in Group LD don’t ask for it except after 24 hours.

We found that adding dexmedetomidine to levobupivacaine in SNB prolongs the duration of block and postoperative analgesia time.

These findings go with the results of Saumya et al., [13] who studied the effect of combining dexmedetomidine with levobupivacaine with respect to duration of motor and sensory block and duration of analgesia. Patients scheduled for elective forearm and hand surgery were divided into two equal groups in a randomized double blind fashion. The patients received brachial plexus block via supraclavicular route with the help of nerve stimulator. In the first group 35cc of levobupivacaine with 1ml of isotonic saline and in the other group 35cc of levobupivacaine with 1ml of (100 microgram) of dexmedetomidine was given. Results was sensory and motor block durations and duration of analgesia were longer in the dexmedetomidine group as compared to saline group.

These findings also go with the results of Vinod et al., [14] who compared clonidine and dexmedetomidine as an adjuvant to local anaesthetic agent in ultrasound guided axillary brachial plexus block with respect to hemodynamic parameters, onset and duration of sensory, motor block and duration of analgesia. In this study patients scheduled for elective upper limb surgeries under axillary brachial plexus block were divided into two equal groups in a randomized, double blinded fashion. Group C received clonidine 1µg/kg and Group D received dexmedetomidine 1µg/kg added to levobupivacaine 0.5% (36cc). They found that duration of sensory block, motor block and post operative analgesia was significantly longer in dexmedetomidine group.

Also Esmaoglu et al., [15] studied the effect of adding dexmedetomidine to levobupivacaine for axillary brachial plexus blockade. The primary endpoints were the onset and duration of sensory and motor block and duration of analgesia. They found that sensory and motor blockade durations and duration of analgesia were longer in group receiving dexmedetomidine than in the other group and this goes with our study.

Our findings go in agreement of Atul et al., [16] who assess the effect of dexmedetomidine added to levobupivacaine in supraclavicular brachial plexus in adult patients undergoing upper limb orthopaedic surgeries under supraclavicular brachial plexus block. Adult patients undergoing upper limb orthopaedic surgeries under supraclavicular brachial plexus block were randomly divided into two groups, the first were administered 29mL of 0.5% levobupivacaine plus 1ml NS and the other group were given 29ml of 0.5% levobupivacaine with dexmedetomidine 1µg/kg, the onset time and duration of sensory and motor blockade were recorded with results that onset of sensory and motor block was significantly faster in group receiving dexmedetomidine compared to the other group. Rescue analgesic requirements were significantly less in group receiving dexmedetomidine compared to the other group.

Conclusion:

We found that addition of dexmedetomidine to levobupivacaine in scalp nerve block increase duration of analgesia and gives better control of hemodynamic measurements postoperatively.

References


