

A CLINICAL COMPARISON OF COMPOUNDED SOLUTION (2% XYLOCAINE & 0.5% BUPIVACAINE) WITH 0.5% BUPIVACAINE IN EPIDURAL ANALGESIAM. Sathesha¹, K. S. Nagesh², R. S. Prasad³**HOW TO CITE THIS ARTICLE:**

M. Sathesha, K. S. Nagesh, R. S. Prasad. "A Clinical Comparison of Compounded Solution (2% Xylocaine & 0.5% Bupivacaine) with 0.5% Bupivacaine in Epidural Analgesia". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 44, September 15; Page: 10850-10856, DOI: 10.14260/jemds/2014/3415

ABSTRACT: Epidural Analgesia is used for relief of pain during and following surgical operations, for relief of chronic pain, for relief of pain in labour, reduction of bleeding by producing sympathetic blockade and hypotension during surgery or to supplement light general anaesthesia, thereby suppressing the transmission of afferent impulses and autonomic and hormonal response to surgery. The commonly used drugs for epidural analgesia are 2% xylocaine and 0.5% bupivacaine. Mixing of the local anaesthetics and altering the pH have been found to be safe and cost effective.^{1,2} our study was a prospective randomized controlled double blind study to investigate effect of the benefits of usage of a compounded solution (2% xylocaine and 0.5% bupivacaine in a 1:1 ratio) over a single drug (0.5% bupivacaine) and ascertain whether it can be recommended for routine use in epidural analgesia in regular anaesthetic practice.^{3,4,5} The following parameters are Studied 1) The time of onset of analgesia. 2) The quality of analgesia. 3) The degree of motor blockade. 4) Duration of analgesia. 5) Safety of compounding local anaesthetics. **METHODS AND MATERIAL:** One Hundred Adult Patients of either sex ranging between 20-60 years of age belonging to ASA grade 1 and II were studied. All patients were at random divided into 2 groups fifty in each group. Group A received 0.5% bupivacaine 15cc. Group B received a mixture of 0.5% bupivacaine and 2% xylocaine (7.5cc + 7.5cc) **RESULTS:** Mean time of onset of analgesia in group B was lower (11.50 + 2.05) as compared to group A (22.24 + 2.18) and this difference was statistically highly significant (P<0.001). 16% of group A and 6% of group B required to be changed over to general anaesthesia. Grade IV motor blockade was seen only in 24% of group A and 30% of the group B which is significant. Mean duration of action in group A was higher (128.90 + 6.70) than in group B (98.30 + 5.29) and this difference was statistically significant. **CONCLUSIONS:** The compounded solution of 0.5% bupivacaine and 2% lignocaine in 1:1 ratio totaling 15cc is superior to 0.5% bupivacaine alone as single agent for epidural blockade in view of rapid onset, better motor and sensory blockade, and better quality of analgesia and less incidence of complications.

KEYWORDS: Epidural, compounded solution, lignocaine, bupivacaine.

INTRODUCTION: Although the techniques of epidural analgesia do not offer the economy of the drug dosage of motor blockade of spinal anaesthesia, they are currently more versatile and better studied. The commonly used drugs for epidural analgesia are 2% xylocaine and 0.5% bupivacaine. Xylocaine produces good results but its duration of action is short whereas with bupivacaine, through it has a longer duration of action it takes longer time to start acting.

Mixture of local anaesthetics permit the use of high concentrations in lesser volumes to get a good surgical block.^{6,7,8} Compounding the local anaesthetics bring about rapid onset of action, better relaxation with minimal or no side effects.⁹ So to know the effectiveness of compounding the local anaesthetics, we have in our study, used 2% xylocaine and 0.5% bupivacaine in a 1:1 ratio.

METHODS: After obtaining approval from the Institutional Ethics Committee and informed consent, 100 patients undergoing various surgeries viz., gynecological, general surgical and orthopaedic, were selected at random.

All the patients were of ASA grade I or II and aged between 20 and 60. They were divided into 2 groups and received the following drugs.

Group A: 0.5% bupivacaine-15cc

Group B: Mixture of 0.5% bupivacaine and 2% xylocaine (7.5cc + 7.5cc).

During the pre-operative visit a detailed and pre-operative valuation of the patients done. Laboratory investigations included routine blood (Hb%, TC, DC, ESR), urine, blood urea nitrogen, sugar ECG and chest screening. The procedure was explained to the patient and consent was obtained. Epidural analgesia was given at L2-L3 inter space.

The following parameters were observed

1. **Time of onset of analgesia in minutes:** It was recorded a interval between the time of injection into the epidural space and development of loss of sensation to pin prick.
2. **Quality of analgesia:** This was graded as follows:
 - GRADE I- Analgesia was complete and sedatives were administered only to relieve apprehension.
 - GRADE II- Analgesia was incomplete, inadequate or patchy and supplementation was needed with narcotics or ketamine N20/02/Halothane.
 - GRADE III- Analgesia was very poor and the technique was changed over to general anaesthesia.
3. **Degree of motor blockade:** This was assessed ever 2-5 minutes using BROMAGE SCALE and graded into 4 catagories as follows:
 - GRADE I – No block – 0% - full flexion of knee and feet possible
 - GRADE II – Partial block – 33% - Just able to flex knees but full flexion of feet Possible.
 - GRADE III – Almost complete-66% - Unable to flex knees but flexion of feet possible.
 - GRADE IV – Complete block – 100% - Unable to flex knees or feet.
4. **Duration of analgesia:** This was measured as the interval between onset of analgesia and regression of analgesia by 2 segments or when the patient complained of pain, whichever occurred first.

The pulse rate and blood pressure was monitored throughout the procedure and intravenous fluids were administered. Ringer's lactate and Dextrose saline was used in majority of the cases. Respiratory movements were observed.

Hypotension was treated with oxygen and intravenous fluids administered fast and injection of pressor drug – mephenstramine as and when required. When there was bradycardia atropine was given.

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All the patients were assessed on the day of surgery and on the first, second and seventh day post operatively to note any complications such as backache, nausea, vomiting, retention of urine, any signs of neurological sequelae or meningeal irritation.

Student test (two tailed, independent) and Mann Whitney U test were used to compare the parametric data between the groups. Chi-square/Fisher Exact test has been used to compare nominal data as and when required. P value of less than 0.05 was considered statistically significant.

RESULTS: Mean age of the patients is shown in table 1.

The parameters studied in both A & B groups are

1. Time of onset of analgesia
2. Quality of analgesia
3. Degree of motor blockade
4. Duration of analgesia
5. Complications-intra operative and post-operative.

1. TIME OF ONSET: Table II shows onset of analgesia in two groups A & B in minutes. Mean time of onset of analgesia in group B was lower (11.50 + 2.05) as compared to group A (22.24 + 2.18) and this difference was statistically highly significant ($P < 0.001$).

2. QUALITY OF ANALGESIA:

GROUP A:

- 60% (30) had grade I analgesia.
- 24% (12) had grade II analgesia.
- 16% (8) had grade III analgesia.

GROUP B:

- 80% (40) had grade I analgesia.
- 14% (40) had grade II analgesia.
- 6% (3) had grade III analgesia.

From the above observations it was noted that 80% of the patients in group B (i.e. using a mixture of 2% xylocaine and 0.5% bupivacaine in 1:1 concentration) and 72% of the patients in group A (using 0.5% bupivacaine) did not require supplementation.

24% of the patients of group A and 1% in group B needed to be supplemented. 16% of group A and 6% of group B required to be changed over to general anaesthesia. So it is evident that the analgesia was better in Group B when compared to Group A.

3. DEGREE OF MOTOR BLOCKAGE: Degree of motor blockade was assessed according to the Grading done by bromage. 56% patients of group A and 60% of group B had grade III motor blockade. Though these figures do not show much of a difference grade IV blockade was seen only in 24% of group A and 30% of group B, which is significant.

4. DURATION OF ANALGESIA: Mean duration of action in group A was higher (128.90 + 6.70) than in Group B (98.30 + 5.29) and this difference was statistically significant.

5. INTRA OPERATIVE COMPLICATIONS: Hypotension was considered when the systolic blood pressure fell by more than 30% of the pre anaesthetic value. It was seen in 2 patients of group A and in one group B. It was promptly treated by infusing fluids, administration of oxygen and vasopressors. Bradycardia (heart rate < 60 beats/min) was seen in 2 patients of group A and in group B and this was treated with atropine.

Shivering was seen in 5 patients of group A and 3 in group B.

There has been no complaint of nausea and vomiting in either of these groups.

6. POST OPERATIVE COMPLICATIONS: Backache and retention of urine was seen in both the groups with no significant difference. However there was no incidence of nausea and vomiting and neurological sequelae in both groups until they were discharged from hospital (i.e. 7-10 days from date of surgery).

DISCUSSION: Epidural analgesia is a commonly practiced form of anaesthesia worldwide and with the recent trends shifting back to regional techniques, epidural analgesia gains importance to a great extent. Even with the importance increasing, we do not have an ideal agent for epidural analgesia at our disposal. Hence the search for an agent, with quicker onset of action, which provides good quality of analgesia and adequate muscle relaxation, sufficient duration of action along with a wide margin of safety is constantly on.

Various drugs such as tetracaine, etidocaine, lignocaine and bupivacaine have been tried for epidural analgesia.³ Etidocaine is twice as toxic as lignocaine and tetracaine, though it has longer duration of action, its margin of safety is narrow.¹¹ Bupivacaine has a slow onset of action and muscle relaxation is inadequate. With all these disadvantages, there is not a single drug that can be considered as an ideal agent for epidural analgesia.

In this present study onset of analgesia in group A (when 0.5% bupivacaine was used alone) was 22.24 + 2.18 minutes and that for group B (where mixture containing 2% xylocaine and 0.5% bupivacaine in 1:1 concentration was used) was 11.50 + 2.05 minutes. This in comparison with the study done by LT Seow et al showed that onset of analgesia was 16-25 minutes and that of the mixture containing 0.5% bupivacaine and 2% xylocaine was 10 to 14 minutes.¹⁰ Our figures correlate with the above quoted study and the quicker onset of analgesia with the mixture group is statistically significant.

Onset of action is related to ionization constant of each agent.

Ionization constant of xylocaine is 7.9 when injected into the tissues. This drug will have 65% of ionized form and 35% of base form, Bupivacaine has an ionization constant of 8.1 and only 15% of it is in the base form. Hence the onset of action is found to be faster in the mixture group when compared to the group which has bupivacaine alone.

DURATION OF ACTION: Duration of action in the present study are:

Group – A - 128.90 + 6.70

Group – B - 96.3 + 5.29

As per the study done by L.T. Seow et al, (1982) duration of action for bupivacaine alone was 113 to 138 minutes and that for mixture containing 2% xylocaine and 0.5% bupivacaine in 1:1 concentration was 89 to 98 minutes. This Correlates Well with this study.

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QUALITY OF ANALGESIA: In group A 24% of the patients had grade II analgesia and 16% had grade III which required supplementation and conversion to general anaesthesia. Group B 14% had grade II and 6% grade III analgesia which required supplementation.

This implies that the quality of analgesia, obtained by mixture of local anaesthetics, is superior to use of 0.5% bupivacaine alone.¹² This statement is substantiated by the opinion of Samtani RJ et al, stating that the sensory block, degree of motor paralysis and cardiovascular stability were significantly better with mixture than with individual drugs.

As assessed by the operating surgeon and by Bromage Scale in group A, 56% and 24% of patients had III and IV degree of motor blockade respectively and in group B, 60% and 30% of patients had III and IV degrees of motor blockade.

It is evident that motor blockade is better with the compounded solution. Seow Lt et all and Howell. P in their individual studies state that onset and complete motor blockade was profound and fastest with the mixture containing equal proportion of lignocaine and bupivacaine.

Intra operative complications such as hypotension, bradycardia and shivering were noticed in 4% and 10% respectively in group A and 2% and 6% respectively in group B. The complications and percentage of incidents of each parameter was less in group B as compared to group A.

In conclusion the compounded solution of 0.5% bupivacaine and 2% lignocaine in 1:1 ration totaling 15cc in place of 0.5% bupivacaine alone as a single agent for epidural blockade in view of rapid onset, better motor and sensory blockade and quality of analgesia.

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| Age (in years) | Group A | | Group B | |
|----------------|-----------|------------|-----------|------------|
| | No | % | No | % |
| 20-30 | 13 | 26 | 15 | 30 |
| 30-40 | 20 | 40 | 12 | 24 |
| 40-50 | 12 | 24 | 15 | 30 |
| 50-60 | 5 | 10 | 8 | 16 |
| Total | 50 | 100 | 50 | 100 |

TABLE 1: DISTRIBUTION OF CASES ACCORDING TO AGE

| | Groups | No of cases | Range | | Mean | SD | RD | P. sign |
|----|---------------------|-------------|-------|-----|-------|------|------|---------|
| | | | Min | Max | | | | |
| A. | (Bupivacaine group) | 50 | 18 | 26 | 22.24 | 2.18 | 25.4 | <0.01 |
| B. | (Mixture group) | 50 | 8 | 15 | 11.50 | 2.05 | | |

**TABLE 2: TIME OF ONSET OF ANALGESIA - IN MINUTES
COMPARISON OF BETWEEN GROUP A AND GROUP B**

| Group | I | | II | | III | |
|-------|----|----|----|----|-----|----|
| | No | % | No | % | No | % |
| A | 30 | 60 | 12 | 24 | B | 16 |
| B | 40 | 80 | 7 | 14 | 3 | 6 |

TABLE 3: GRADE OF ANALGESIA IN THE 2 GROUPS

| Group | I | | II | | III | | IV | |
|---------|----|---|----|----|-----|----|----|----|
| | No | % | No | No | % | % | No | % |
| Group A | 4 | 8 | 6 | 12 | 28 | 56 | 12 | 24 |
| Group B | 2 | 4 | 3 | 6 | 30 | 60 | 15 | 30 |

TABLE 4: DEGREE OF MOTOR BLOCKADE

| | Groups | No. of cases | Range | | Mean | SD | RD | P. sign |
|----|---------------------|--------------|-------|-----|--------|------|-------|---------|
| | | | Min | Max | | | | |
| A. | (Bupivacaine group) | 50 | 118 | 140 | 128.90 | 6.70 | 27-01 | <0.01 |
| B. | (Mixture group) | 50 | 89 | 150 | 96.30 | 5.29 | | |

TABLE 5: DURATION OF ANALGESIA

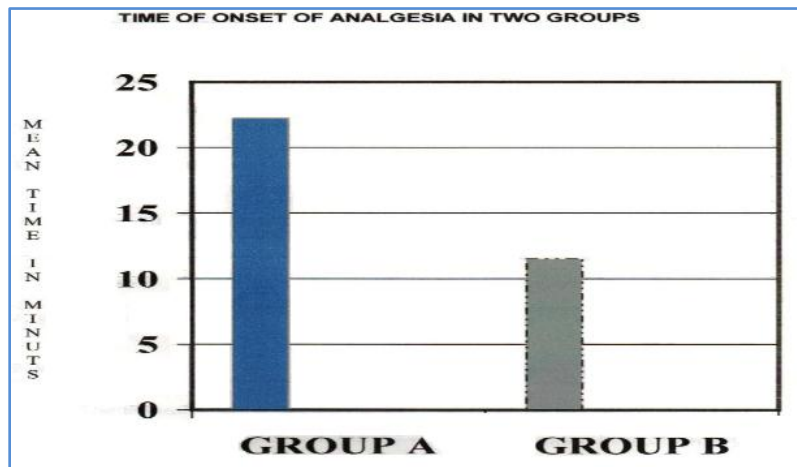


Fig. 1

AUTHORS:

1. M. Sathesha
2. K. S. Nagesh
3. R. S. Prasad

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Anaesthesiology, Bangalore Medical College & Research Institute, Fort Bangalore.
2. Assistant Professor, Department of Anaesthesiology, Sri Jayadeva Institute of Cardiac Sciences & Research, Bannerghatta Road, Jayanagar 9th Block, Bangalore.

3. Professor, Department of Anaesthesia, Medical Superintendent, Oxford Medical College & Research Institute, Yeduvanahalli, Bangalore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. M. Sathesha,
No. 8, 6th Block,
Koramangalam,
Bangalore-560 095.
Email: drsathesham@gmail.com

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