Section: Anaesthesia

Original Research Article

EFFICACY OF GABAPENTIN UNDER COMBINED SPINAL EPIDURAL ANAESTHESIA IN LOWER LIMB ORTHOPEDIC SURGERIES

Harshad N. Mehta[1]

[1]Assistant Professor, Department of Anaesthesia, Shantabaa Medical College & General Hospital Amreli, Gujarat, India.

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CorrespondingAuthor:
Dr. Harshad N. Mehta,
Email: drharshadmehta@gmail.com

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Abstract

Background: Even though there are various methods of providing post operative pain relief epidural analgesia is the one method which can be performed easily, can provide intraoperative and postoperative analgesia better than other methods with better patient comfort. Aim of the research was to study the efficacy of Gabapentin on combined spinal epidural anaesthesia for lower limb orthopedic surgeries with respect to post operative epidural analgesic requirements. **Materials and Methods:** A randomized double blind control study was conducted at Hospital attached to Medical College. Patients were divided into two groups: 60 patients in each group Group G– Patients received cap. Gabapentin 1200 gram (3 capsules of 400mg) Group P – Patients received three placebo capsules. Preoperatively, patients were given three capsules of 400mg Gabapentin or three placebo capsules according to their group one hour before surgery. Parameters Observed were: Time to reach T10 segment sensory block, two segment regression time in subarachnoid block and time to require first epidural top up since the time of subarachnoid block performed.**Result:** The changes in intraoperative pulse rate in both group statistically not significant. The changes in systolic blood pressure during intraoperative period between the two groups are statistically not significant. Changes in diastolic Blood pressure between the two groups are statistically not significant. The observed difference between the two groups in sedation score is statistically significant. The observed difference between the two groups in the time interval between the epidural analgesic supplements is statistically significant. **Conclusion:** Gabapentin before surgery significantly prolongs two segment regression time and duration of analgesia in subarachnoid blockade and it significantly reduces the post operative epidural analgesia requirements.

INTRODUCTION

Pain is a fundamental biological phenomenon. The International Association for the study of pain has defined Pain as an unpleasant sensory and emotional experiences associated with actual or potential tissue damage. Pain is always underestimated and undertreated. The relief of pain during surgery as well as in the post operative period is the main part of anesthesia. Orthopedic patients can be particularly challenging for anesthesiologists. These patients represent a broad scope of problems, ranging from an elderly patient with multiple co-morbid conditions to a young.[1,2]

Many orthopedic procedures are well suited for regional anesthetic techniques. Regional anesthesia may reduce the incidence of major peri operative complications like, deep vein thrombosis (DVT), pulmonary embolism (PE), blood loss. In addition, regional anaesthesia provides superior post operative pain relief. Even though there are various methods of providing post operative pain relief, like intravenous opioids, NSAIDS, patient controlled analgesia, continuous peripheral nerve blocks, epidural analgesia etc, Epidural analgesia is the one method which can be performed easily, can provide intraoperative and postoperative analgesia better than other methods with better patient comfort.[3,4]

But in epidural analgesia, it needs higher volume or higher dosage and sometimes it may exceed toxic dosage. So as to reduce the requirement of post operative epidural analgesic supplementation there are drugs that can be used as preemptive analgesia like opioids, NSAIDS etc.[5,6] This study involves, using Gabapentin, (An atypical anticonvulsant Which was originally used for chronic pain) and the effects of Gabapentin on combined spinal epidural anaesthesia in respective of post operative epidural

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analgesic requirements. Hence the aim was to study the efficacy of Gabapentin on combined spinal epidural anaesthesia for lower limb orthopedic surgeries with respect to post operative epidural analgesic requirements.

MATERIALSANDMETHODS

After Institute ethical committee approval and written consent from the patients, A randomized double blind control study was conducted at Hospital attached to Medical College.

Inclusion Criteria

120 patients who were posted for lower limb orthopedic surgeries, in the age Group of 18 – 60 years in the ASA I and II grade were included.

Exclusion Criteria

Patients who were contraindicated to central neuraxial blockade Age > 60yrs Known allergic patients to local anesthetics, and Gabapentin

Patients were divided into two groups: 60 patients in each group Group G– Patients received cap. Gabapentin 1200 gram (3 capsules of 400mg) Group P – Patients received three placebo capsules. Preoperatively, patients were given three capsules of 400mg Gabapentin or three placebo capsules according to their group one hour before surgery.

Under strict aseptic precautions patient in sitting position, epidural space identified by using 18G Tuohy needle with loss of resistance technique at L2-L3 inter vertebral space. After the epidural space was identified, epidural catheter was inserted and 4 cm length of catheter kept inside the space.

A test dose of 3ml of 1.5% lignocaine with 15µg adrenaline was given. After excluding inadvertent subarachnoid or intravascular placement of catheter, Subarachnoid block was performed at L3- L4 Inter space by using 23G Quincke type spinal needle. 3ml of Inj. Bupivacaine 0.5% (heavy) was injected into the subarachnoid space. Patient positioned supine gently.

When the sensory blockade reached T10 level, surgery was commenced. Intra operatively pulse rate, respiratory rate, blood pressure, saturation of Hb (SpO2) , urine output were monitored. After the surgery, patient was shifted to ICU for post operative pain management. In the ICU, post operative epidural analgesia was given in the dose of Inj. Bupivacaine 0.125% 8 ml with Fentanyl 2 µg / ml and time of epidural analgesic supplementation was noted. On next day morning at 8.30am, three Gabapentin capsules (or) Placebo capsules were given respectively according to their groups. If side effects were present they were treated accordingly.

PARAMETERS OBSERVED 1. Time to reach T10 segment sensory block - since the time of subarachnoid block to loss of pin prick sensation at T10 2. Two segment regression time in subarachnoid block (in minutes) - time to regress sensation to pin prick two segments from the highest level of blockade. 3. Time to require first epidural top up since the time of subarachnoid block performed (when VAS score > 5)

Visual Analogue Pain Score

Patients were asked to mark a point on the 10 point visual analogue scale of Pain according to the intensity of pain. It was observed every hour. The pain relief is graded according to VAPS as follows: (Elbaz. 1984).

VAPS Quality of Analgesia

0 - 1 Excellent
1 - 4 Fair
4 - 6 Good
6 - 8 Slight
8 -10 No relief

Ramsay sedation score every 4 hours up to 48 hours since the time the study drug was given Ramsay Sedation Score:

1-Anxious / Restless / Both
2-Cooperative / Oriented
3-Responds to commands only
4-Brisk response to light touch / Glabellar tap / loud auditory stimuli
5-Sluggish response to light touch / glabellar tap
6-No response at all

Statistical analysis

Data analysis was done with the help of computer using Epidemiological Information Package (EPI 2008). Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. Kruskul Wallis chi-square test was used to test the significance of difference between quantitative variables. A 'p' value less than 0.05 is taken to denote significant relationship.

RESULTS

Age distribution in the Gabapentin (group G) was between 18 years to 60 years with mean age of 41.5 years ±15.8 (S.D.).In the placebo group (group P) age distribution was between 18 years to 60 years with mean value of 41.9 years ± 10.9(S.D.) The Observed difference between the two groups in age is statistically not significant (‘p’= 0.08243,>0.05) [Table 1].

Total number of male patients in group G was 38, in group P is 46 and number of female patients in group G was 22, in group P 14.Sex distribution is not statistically significant (‘p’= 0.398 >0.05) between the two groups. [Table 2]

The height distribution in Gabapentin group (Group G) varied from 154cm - 167cm and the mean height was 160. 8 cm ±3.8(SD). The height distribution in placebo group (Group P) varied from 156 -167 cm and the mean height was 162.1cm ±3.4(SD). The weight distribution of the patients in Gabapentin Group (GroupG) varied from 50 -62 kgs and the mean weight was 56.1kg ± 3.3(SD) and placebo Group (GroupP) varied from 52 -62 kg and the mean weight was 56.7 kg ± 2.8(SD).

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The changes in intraoperative pulse rate in both group statistically not significant ('p'= 0.2287, >0.05) The mean pulse rate in (Group G) Gabapentin group was 86.5 ±2.8 (SD) whereas in placebo group (group P) was 83.9 ±6.0(SD).

The mean systolic blood pressure during the intra operative period in Gabapentin group (group G) was116.5mmHg ±3.1 (SD).The mean systolic blood pressure in placebo group (group P) was 116.3mmHg ±3.2(SD). The changes in systolic blood pressure during intraoperative period between the two groups is statistically not significant ('p' = 0.859,> 0.05).

The mean diastolic blood pressure in Gabapentin group (Group G) was 74.0mmHg ±2.8(SD) and that in placebo group (group P) was 73.1 mmHg ±2.6(SD).Changes in diastolic Blood pressure between the two groups is statistically not significant ('p' = 0.8941, >0.05).

Ramsay sedation score was monitored every 4 hours since the oral capsules given up to 48 hours and compared in both groups. The mean sedation score on day 1 in Gabapentin group (group G) was 2.33 ±0.48(SD) and that in placebo group was 1.83 ±0.38(SD). The mean sedation score on day 2 in group G was 2.17 ±0.38 (SD) and that in group P was 1.4 ±0.5(SD). The observed difference between the two grops in sedation score is statistically significant.

The time interval between each epidural analgesic supplements in both groups were compared by using simple 't' test. The mean time interval in Gabapentin group (group G) was 8.254hrs ±1.5276 (SD) and the same in placebo group was 4.8 hours ±0.529 (SD). The observed difference between the two groups in the time interval between the epidural analgesic supplements is statistically significant.

Table 1: Age wise Distribution of Study Participants

Age (Years)	Mean	Standard Deviation
Group G	41.5	15.8
Group P	41.9	10.9

Table 2: Gender wise Distribution of Study Participants.

Gender	MaleN (%)	FemaleN (%)
Group G	38 (63.3)	22 (36.6)
Group P	46 (76.6)	14 (23.3)

DISCUSSION

NMDA receptor is a complex ligand gated ion channel that mediates influx of calcium ion when activated. Partial depolarisation of the neuron after glutamine activation causes release of a magnesium plug and allows calcium influx into the neuron. These receptors are known to be found in high concentrations in the hippocampus and have been attributed a key role in the process of central sensitisation of painful stimuli, commonly known as the wind-up phenomenon, leading to hyperalgesia.[7-10]

The alpha 2 delta subunit of the voltage-dependent calcium channel is a binding site for Gabapentin and antihyperalgesic action for Gabapentin is mediated by its binding to this site on the voltage-dependent calcium channel.[11,12]

Gabapentin has high sedative property by acting on central nervous system, and that is the main side effect. Patient may have dizziness and sedation. various studies proved that it alters sleep pattern also the mean sedation score in gabapention group (group G) on day 1 is 2.33, on day 2 is 2.17 and that in placebo group on day 1 is 1.83, and on day 2 is 1.4. Ramsay sedation score is significantly higher in Gabapentin group on day1 ('p'=0.0401,5), in Gabapentin group (group G) is 228.5 minutes and that in placebo group is 195.5 minutes.

The time to require first Epidural analgesic requirement is prolonged in Gabapentin group than placebo group which is statistically significant ('p'=0.0001,< 0.05) Time interval between the epidural supplements The mean time interval in Gabapentin group (group G) is 8.254hrs ±1.5276(SD) and the same in placebo group is 4.8 hours ± 0.529(SD) The time interval between each epidural supplements is significantly prolonged in Gabapentin group (group G) than in placebo group (group P) and which is statistically significant ('p'=0.0001,

These two-parameter showed that Gabapentin has effect on subarachnoid block which prolongs the two-segment regression time and duration of Analgesia of subarachnoid block. The total number of epidural analgesic requirements on day 1, varied from 1-2 supplements in Gabapentin group, in placebo group varied from 2-3 supplements.

Total number of epidural analgesic requirements on day 2, varied from 2-3 supplements in Gabapentin group, in placebo group varied from 3-4 supplements. Totally in Gabapentin group only one patient received 6 supplmentations and in placebo group two patients received 6 supplementations. The total number of epidural analgesic requirements are significantly less in Gabapentin group than that in placebo group.

In this study cap, Gabapentin which was given 1 hr before surgery had no effect on time to reach T10 segment sensory blockade The two segment regression time and time to require first epidural analgesic supplementation are significantly prolonged in Gabapentin group than placebo group. The total number of epidural analgesic requirements

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is significantly lower in Gabapentin group than placebo group.

The time intervals between the epidural supplements are significantly prolonged in Gabapentin group than in placebo group. Patients in Gabapentin group have better sedation score but with side effect of dizziness. The study was done by A. Turan, et al showed, up to 72 hours by using PCA pump for epidural top up, the total usage was only 38 hours in Gabapentin (1200mg) group while comparing 57 hours in placebo group.

The post operative VRS pain score was also lower in Gabapentin group than in placebo. The effects of gabapentin on acute and chronic pain after inguinal herniorrhaphy showed that 1200 mg of gabapentin which was given orally, significantly reduced rescue analgesic requirements or opioids consumption in the post operative period.

Other studies reported 300 to 800 mg of gabapentin is effective in reducing supplemental analgesia. As various studies showed that using 1200mg of Gabapentin is effective in reducing opioid demand and pain score, 1200mg of Gabapentin was choosen for this study. In this study 1200 mg Gabapentin significantly reduced number of post operative epidural analgesic supplementations; it prolonged the two-segment regression time and produced better sedation also than the placebo group.

CONCLUSION

Gabapentin before surgery significantly prolongs two segment regression time and duration of analgesia in subarachnoid blockade and it significantly reduces the post operative epidural analgesia requirements.

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