MODE OF DELIVERY FOLLOWING LABOR EPIDURAL ANALGESIA: INFLUENCE OF ROPIVACAINE AND BUPIVACAINE

Introduction

Epidural analgesia is a popular and effective method for pain relief during labor. Bupivacaine is a commonly used local anesthetic for labor epidural analgesia. Ropivacaine is an amino acid local anesthetic that is structurally related to bupivacaine with a similar potency and duration, but ropivacaine has less cardiac toxicity than bupivacaine and produces less motor blockade. These properties make ropivacaine a desirable local anesthetic agent for obstetrical analgesia.

The purpose of the present study was to compare the cesarean section and instrumental delivery rates for patients receiving labor epidural analgesia using bupivacaine and ropivacaine. The medical records of 500 consecutive patients receiving bupivacaine for labor epidural analgesia were reviewed. After a 3-month familiarization period for ropivacaine, the records of 500 consecutive patients receiving ropivacaine for labor epidural analgesia similarly were reviewed.

The groups did not differ demographically. The instrumental delivery rate was 14.2% for the bupivacaine group and 9.8% for the ropivacaine group. The cesarean section rate was 14% for the bupivacaine group and 10.2% for the ropivacaine group. At our facility, the use of ropivacaine decreased both cesarean section and instrumental delivery rates when compared with bupivacaine in the population studied.

Key words: Bupivacaine, cesarean section, epidural analgesia, ropivacaine.

Method

This retrospective study examined the medical records of patients receiving labor epidural analgesia at a community hospital. Bupivacaine had been the primary local anesthetic for labor epidural analgesia, but it was gradually replaced with ropivacaine. In an effort to identify any difference in the use of ropivacaine as compared with bupivacaine, the records of 500 consecutive patients receiving bupivacaine for labor epidural analgesia were reviewed. Following a 3-month familiarization period, I reviewed records of 500 consecutive patients receiving ropivacaine for labor epidural analgesia for comparison with bupivacaine. Epidural catheters for labor analgesia were placed by 1 of 5 Certified Registered Nurse Anesthetists at the L2-3, L3-4, or L4-5 intervertebral space. Initial local anesthetic doses and epidural infusion rates were determined by individual patient needs and clinical judgment of the anesthesia provider. All patients received a 3-mL epidural test dose with 1.5% lidocaine with epinephrine 1:200,000. The bupivacaine group received an initial bolus of 0.25% bupivacaine followed by a continuous infusion of 0.125% bupivacaine. The ropivacaine group received an initial bolus of 0.2% ropivacaine followed by a continuous infusion of 0.2% ropivacaine. Both groups received 100 µg of fentanyl with the initial dose and 2 µg/mL of fentanyl in the continuous infusion solution.

Results

I examined 500 records for each group. The groups did not differ demographically (Table). The instrumental delivery rate for the bupivacaine group was 14.2 (71 of 500) and 9.8% (49 of 500) for the ropivacaine group. The cesarean section rate was 14% (70 of 500) for the bupivacaine group and 10.2% (51 of 500) for the ropivacaine group. The mean infusion rate for bupivacaine was 11.2...
Table. Patient demographic and labor characteristics

<table>
<thead>
<tr>
<th></th>
<th>Bupivacaine</th>
<th>Ropivacaine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>28.01 (15-42)</td>
<td>28.31 (15-42)</td>
</tr>
<tr>
<td>Height (in)</td>
<td>64.84</td>
<td>64.68</td>
</tr>
<tr>
<td>Ethnicity (%)</td>
<td></td>
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</tr>
<tr>
<td>White</td>
<td>82.4</td>
<td>82.4</td>
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<tr>
<td>Black</td>
<td>8.2</td>
<td>8.4</td>
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<tr>
<td>Hispanic</td>
<td>7.2</td>
<td>7.8</td>
</tr>
<tr>
<td>Other</td>
<td>2.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Primiparous (%)</td>
<td>49.4</td>
<td>46</td>
</tr>
<tr>
<td>Gestational age (wk)</td>
<td>38.84 (33-42)</td>
<td>39.01 (31-42)</td>
</tr>
<tr>
<td>Infusion rate (mL/hr)</td>
<td>11.22 (8-16)</td>
<td>10.37 (5-15)</td>
</tr>
<tr>
<td>Redose bolus (%)</td>
<td>34.8</td>
<td>13.8</td>
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</tbody>
</table>

*Unless indicated, data are presented as mean and (range).

mL/h (range 8 to 16) with 34.8% (174 of 500) receiving at least 1 redose bolus. The mean infusion rate for the ropivacaine group was 10.4 mL/h (range 5 to 15) with 13.8% (69 of 500) receiving at least 1 redose bolus.

Discussion

The instrumental delivery and cesarean section rates for the ropivacaine group were lower when compared with the bupivacaine group. The instrumental delivery rate decreased by 31%, and the cesarean section rate decreased by 29.5%. Writer et al.11 found that significantly more multiparae receiving epidural analgesia with bupivacaine required instrumental delivery than those receiving ropivacaine. In previous studies, bupivacaine and ropivacaine have been found to have no significant analgesic differences at equal concentrations. 4,5 In a recent study, Polley et al.14 found that ropivacaine was significantly less potent than bupivacaine for epidural analgesia in the first stage of labor. However, the present study compared 0.125% bupivacaine with 0.2% ropivacaine. Ropivacaine at the higher concentration used in the present study seems to have provided superior analgesia for both the first and second stages of labor; this is reflected in the overall lower infusion rates and lower incidence of epidural redosing. Bupivacaine infusion rates were a mean of 11.2 mL/h (range 8 to 16) and ropivacaine infusion rates a mean of 10.4 mL/h (range 5 to 10). Patients receiving bupivacaine required greater supplemental analgesia (as indicated by the number of redose boluses) during labor analgesia (174 of 500 or 34.8%) when compared with patients receiving ropivacaine (69 of 500 or 13.8%). This is consistent with a study by Meister et al.,15 which demonstrated that significantly more patients in the bupivacaine/fentanyl group required supplemental analgesia than the ropivacaine/fentanyl group during labor.

Bupivacaine epidural analgesia has been associated with an increased incidence of cesarean section in nulliparous women. An increased concentration of ropivacaine, being clinically indistinguishable from bupivacaine,4,5 would seem likely to increase cesarean section rates. However, the present study demonstrated a lower cesarean section rate than that of bupivacaine, which may be attributable to the lesser degree of motor nerve blockade for ropivacaine. 7,8,10

Lower infusion rates and fewer redose boluses expose the patient to less medication and a decreased risk of accidental intravenous injection if the epidural catheter has migrated into a blood vessel. The reduced cesarean section rate provides a significant cost savings. A cesarean section, with 1-hour operating room time and 1-hour recovery time, including surgical consumables, costs an average of $5,200, compared with the vaginal delivery process and 1-hour recovery with consumables at an average cost of $550.

The results of the present study demonstrate a potential advantage of ropivacaine over bupivacaine for patients receiving epidural analgesia in decreasing cesarean section and instrumental delivery rates. The present study did not exclude patients undergoing a trial of labor following cesarean section, which may have influenced the overall cesarean section rate. Individual anesthesia provider dosing schedules and infusion rates may have influenced the study. Establishing a standard dose and the infusion rate based on specific patients’ heights may have limited this variable.

Conclusion

The use of ropivacaine decreased both cesarean section and instrumental delivery rates when compared with bupivacaine in the population studied. Ropivacaine’s lower infusion rates and decrease in redose boluses compared with bupivacaine reduce the potential risk of systemic and intravascular exposure of the patient to local anesthetic medication.

REFERENCES

4. Owen MD, D’Angelo R, Geranchar JC, et al. 0.125% ropivacaine is similar to 0.125% bupivacaine for labor analgesia using patient-


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