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Original contribution

Risk factors for failed reactivation of a labor epidural for postpartum tubal ligation: a prospective, observational study☆

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Abstract

Study objective: To determine specific risk factors that increase the failure rate of labor epidurals reactivated for use as a surgical block for postpartum tubal ligation.

Design: Prospective, observational study.

Setting: Labor and delivery suite and operating rooms at the Women and Infants Center.

Patients: One hundred patients undergoing postpartum tubal ligation with an existing labor epidural that is documented to be within 2 cm of initial placement.

Measurements: Body mass index, patient satisfaction with her epidural during labor and delivery, time from delivery to reactivation for tubal ligation, depth to loss of resistance, and the need for top-ups during labor were recorded preoperatively. *Failure to reactivate* was recorded and defined as any patient that (1) did not achieve a T_6 level to pinprick, (2) had perceived pain (pain score >3) that required administration of an intravenous opioid or local anesthetic infiltration, or (3) required conversion to general anesthesia.

Main results: The overall success rate of reactivation was 78%. Significant risk factors for failure to reactivate were (1) poor patient satisfaction ($P = .016$), (2) increased time from delivery to reactivation ($P = .044$), and (3) the need for top-ups during labor and delivery ($P = .032$).

Conclusion: Poor satisfaction score of the epidural during labor and delivery, increasing time from delivery to epidural reactivation for tubal ligation, and the need for top-ups during labor and delivery increase the incidence of reactivation failure. No correlation was found with body mass index or loss of resistance and failure to reactivate.

1. Introduction

Bilateral tubal ligation is a popular form of birth control in the United States. The most recent data show that among the nearly 38 million women of child-bearing age who use some form of contraception, bilateral tubal ligation is the second most common method at 15.5% [1]. Given that patients are already admitted to the hospital and the fallopian tubes are easily accessible through a small midline incision below the umbilicus, postpartum tubal ligation (PPTL) is popular in patients who have undergone an uncomplicated vaginal delivery and desire permanent sterilization.

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Anesthesia can be delivered for this procedure through various techniques, which include general and neuraxial anesthesia. Because most patients in the immediate postpartum period are at continued risk for delayed gastric emptying, especially to solid foods, and airway edema, neuraxial anesthesia is often performed for these procedures [2-4]. Although overall data are inconclusive, the American Society of Anesthesiologists Task Force on Obstetric Anesthesia supports the use of neuraxial over general anesthesia for patients undergoing PPTL [5].

Given that epidural analgesia is the preferred modality for pain control in laboring women and the majority of PPTL occur within 24 hours of delivery, reactivation of the labor epidural for surgical anesthesia is routine practice. The success rate of reactivation is documented to be between 74% and 92% [6-8]. Failure to successfully reactivate the epidural can result in increased anesthetic risk to the patient and an increase in cost and resource consumption [7,9,10].

Currently, only a few retrospective studies have been published that assess potential risk factors for failed conversion of a labor epidural to surgical anesthesia for PPTL. These studies demonstrate a lower success rate of epidural reactivation with increasing time from delivery to PPTL [6,8]. A meta-analysis assessing risk factors for failed labor epidural conversion to a surgical block for cesarean delivery showed that having to provide extra bolus medication, or "top-ups," during labor increased the failure rate of conversion to a surgical block [11].

Because nearly one-fourth of epidural reactivation attempts fail and failure can lead to potential anesthetic-related complications and increased health care costs, we designed a prospective observational study to address several risks factors that might decrease the success rate of epidural reactivation. Determining these risk factors might help the practitioner in the decision to pull the labor epidural in favor of another anesthetic technique instead of attempting to reactivate an epidural that has a high probability of failure. We hypothesize that several risk factors, including increasing body mass index (BMI), increased depth to the epidural space, lower patient satisfaction scores with the epidural during labor and delivery, increasing time from delivery to reactivation, and the need for "top-ups" during labor will lead to a higher failure rate of epidural conversion to a surgical block.

2. Materials and methods

2.1. Study participants

This study was approved by the University of Alabama at Birmingham institutional review board, and all patients gave informed written consent. Eligible participants for the study were any patient scheduled for PPTL and who had an epidural placed for labor analgesia. In keeping with our standard departmental procedure, the epidural must be within 2 cm of the initial documented position and securely taped to the back. Measurement of the epidural catheter depth was accomplished by visualization of catheter markings at the skin. Catheters that are not securely taped to the back or have migrated more than 2 cm are routinely removed in favor of another anesthetic option. Other exclusion criteria include documented dural puncture, prolonged sensory or motor block after the labor epidural was discontinued, bladder or sphincter dysfunction, documented nerve damage from epidural placement, inability to ambulate, or seizures during or after delivery. Because all PPTLs are completed within an acceptable time frame after delivery (almost all are performed within 24 hours of delivery), we decided not to establish a specific time from delivery to reactivation as part of the exclusion criteria. A total of 100 patients were enrolled in this study from October 25, 2013, to June 17, 2015.

2.2. Study protocol

Once a patient was enrolled, study data were documented including BMI, depth at loss of resistance (LOR), initial catheter depth, current catheter depth, number of "top-ups" given during labor and delivery, time of delivery, and patient satisfaction with her epidural during labor and delivery determined on a Likert scale ranging from 1 (very dissatisfied) to 10 (very satisfied). Although the amount of catheter threaded into the epidural space was left to the discretion of the anesthesia provider placing the labor epidural, our practice is to secure the multioriface catheter 5 cm into the epidural space because this has been suggested to be the optimal distance [12].

The patient was then taken to the operating room, and standard American Society of Anesthesiologists monitors were placed. A standard protocol for epidural reactivation was followed for all participants in the study. A test dose of 3 mL of 1.5% lidocaine with 1:200 000 epinephrine was given to rule out intrathecal or intravascular migration. Once a negative result in the test dose was confirmed, 3% 2-chloroprocaine was administered in 5-mL increments every 3-5 minutes with a goal of a T_6 level to pinprick bilaterally. No patient received more than 12 mg/kg of 2-chloroprocaine. Once a T_6 level was achieved, intravenous (IV) midazolam was given for anxiolysis. No opioid was administered intravenously or via the epidural during the procedure. The patient was prepped and draped in sterile fashion, and the obstetricians were called to begin the procedure. Surgery start time was documented. For our study, we defined a *failed epidural reactivation* as any patient that (1) did not achieve a T_6 level to pinprick, (2) had perceived pain (a pain score >3 on a scale of 1-10) that required administration of an IV opioid or local anesthetic infiltration of the surgical site by the obstetrician, or (3) required conversion to general anesthesia. Once the surgery was completed, all patients received 30 mg IV ketorolac unless contraindicated and were taken to the postanesthesia recovery unit to receive routine care.

2.3. Statistical analysis

The sample size was calculated using BMI as a single predictor with the understanding that the power of a multivariate