Rates of bacteriuria in laboring women with epidural analgesia: continuous vs intermittent bladder catheterization

Lauren Millet, MD; Steve Shaha, PhD, DBA; Marguerite Lisa Bartholomew, MD

OBJECTIVE: The purpose of this study was to compare the rates of bacteriuria in laboring women with epidural analgesia with the use of intermittent bladder catheterization (IC) vs continuous indwelling Foley catheterization (CIF).

STUDY DESIGN: We conducted a randomized, nonblinded trial in which 160 laboring women received IC or CIF. An initial catheterized urine culture was taken at the time of epidural placement. A second catheterized or voided culture was taken at discharge. Results were analyzed to compare bacteriuria rates between CIF and IC with the use of the Center for Disease Control (CDC) and Infectious Disease Society of America (IDSA) definitions.

RESULTS: Samples from 146 women were analyzed. Randomization, demographics, and labor characteristics were not significantly different between groups; 5.48% of the samples met CDC criteria for bacteriuria, and 17.8% of the samples met IDSA criteria. In the IC group, 7 samples (8.9%) met CDC criteria for bacteriuria, and 18 samples (22.8%) met IDSA criteria for bacteriuria. In the CIF group, 1 sample (1.5%) met CDC criteria, and 8 samples (12.1%) met IDSA criteria. There was a significantly higher rate of bacteriuria by both criteria in the IC group among all deliveries, all vaginal deliveries, and spontaneous vaginal deliveries ($P < .05$).

CONCLUSION: Compared with CIF, IC was associated with significantly higher rates of bacteriuria.

Key words: bacteriuria, epidural analgesia, Foley catheter, intermittent catheterization

Cite this article as: Millet L, Shaha S, Bartholomew ML. Rates of bacteriuria in laboring women with epidural analgesia: continuous vs intermittent bladder catheterization. Am J Obstet Gynecol 2012;206:316.e1-7.

Epidural analgesia, the most effective and least fetal depressant treatment for labor pain, is prescribed on maternal request, unless there is a medical contraindication.[1] The number of women who request epidural analgesia in labor has increased over the last decade to >60%.[2] Because of increased sympathetic and motor blockade, urinary retention is a known side-effect of epidural analgesia. Many laboring women with epidural analgesia cannot sense a full bladder or ambulate independently. As a result, bladder catheterization has become standard of care for these women. The type of catheterization usually is determined by the physician's preference and/or institutional practice patterns. Options include the use of a continuous indwelling Foley catheter or intermittent catheterization.

Urinary tract infections account for 40% of nosocomial infections. Indwelling Foley catheters have been shown to increase the rate of bacteriuria in nonpregnant populations.[3] Female sex and pregnancy increase the risk of bacteriuria; 2-7% of pregnant women will have a positive urine culture at some point during the pregnancy. In nonpregnant premenopausal women, asymptomatic bacteriuria often is transient and does not benefit from antimicrobial treatment.[4] Twenty-five percent of pregnant women with bacteruiria will become symptomatic; antibiotic treatment is recommended to prevent pyelonephritis.[5]

To prevent catheter-associated urinary tract infections in patients with bladder emptying dysfunction, the Center for Disease Control and Prevention (CDC) recommends intermittent catheterization at regular intervals rather than indwelling catheters. Another recommendation states that, in surgical patients, an indwelling catheter should be removed postoperatively within 24 hours, unless appropriate indications support its continued use. The CDC recommendations are based on level IB-II evidence that includes 5 main groups of patients: operative patients, incontinent patients in nursing homes, patients with bladder outlet obstruction, patients with spinal cord injury, and children with myelomeningocele and neurogenic bladder.[6] These recommendations are often applied clinically when patients are treated for intrapartum and postpartum problems, although the studies that support them do not include pregnant or laboring populations.

Elram et al[7] prospectively investigated postpartum bacteriuria rates in 214 la-

From the Department of Obstetrics and Gynecology, John A. Burns University of Hawai'i School of Medicine, Honolulu, HI (Drs Millet and Bartholomew), and the Center for Policy and Public Administration, University of Utah, Salt Lake City, UT (Dr Shaha).

Received Nov. 27, 2011; revised Feb. 17, 2012; accepted Feb. 17, 2012.

Supported by Hawaii Pacific Health/Kapiolani Medical Center for Women and Children and the Department of Obstetrics and Gynecology, John A. Burns University of Hawai'i School of Medicine, Honolulu, HI.

The authors report no conflict of interest.

Presented orally at the 32nd annual meeting of the Society for Maternal-Fetal Medicine, Dallas, TX, Feb. 6-11, 2012.

The racing flag logo above indicates that this article was rushed to press for the benefit of the scientific community.

Reprints: Marguerite Lisa Bartholomew, MD, 1319 Punahou St., Suite 824, Honolulu, HI 96826. mbarthol@hawaii.edu.

0002-9378/$36.00

doi: 10.1016/j.ajog.2012.02.018

boring women with clean-catch urine samples before and after delivery. The rate of acquisition of bacteriuria (≥100,000 colonies/cfu/mL of a single species) during labor was 12.7%. Women who were at risk for urinary tract infection and who were being treated with antibiotics in labor were excluded. Intermittent catheterization, when indicated, was the only catheter method to be used. Intermittent catheterization was associated with an increased risk for postpartum bacteriuria; ≥3 catheterizations yielded a 37.5% rate of bacteriuria.

Evron et al[8] randomly assigned 209 laboring women with clinically diagnosed urinary retention after epidural analgesia to intermittent catheterization or continuous Foley catheterization. The use of antibiotics in labor was not mentioned. The primary outcome, labor duration, was shorter with intermittent catheterization. Postpartum urinary retention and bacteriuria (≥100,000 colonies/mL of same species found in 2 consecutive specimens) were secondary outcomes. There was a 28% rate of postpartum bacteriuria in both groups; however, the study was not powered to show a significant difference in bacteriuria.

We designed this study to analyze the effect of intermittent catheterization vs continuous indwelling Foley catheterization on the rates of bacteriuria in laboring women who receive epidural analgesia. We hypothesized that intermittent catheterization is associated with a lower rate of postpartum bacteriuria than the continuous indwelling Foley.

TABLE 1
Definitions of asymptomatic bacteruiria

Agency	Definition
Center for Disease Control and Prevention[9]	Patient with indwelling catheter within 7 days before culture and 1 urine culture with 100,000 cfu/mL with ≤2 species OR
	Patient without indwelling catheter within 7 days before culture and 2 urine cultures with 100,000 cfu/mL of same organism with ≤2 species, AND
	No fever (38°C), dysuria, urgency, frequency, or suprapubic tenderness
	Clean catch, catheter, aspiration (no catheter tips, not from a bag)
Infectious Diseases Society of America[10]	Clean catch voided urine in women: 2 consecutive voided specimens with isolation of the same bacterial strain in counts of ≥100,000 cfu/mL
	Clean catch voided urine in men: single voided specimen with 1 species in counts of ≥100,000 cfu/mL
	Catheterized urine in women and men: single catheterized specimen with 1 species in counts of ≥100 cfu/mL

cfu, colony-forming unit.

Millet. Bacteriuria in laboring women with epidural analgesia. Am J Obstet Gynecol 2012.

Methods

We conducted a randomized, nonblinded, prospective trial. The study was approved by the Western Internal Review Board and a scientific review committee. Subjects' written informed consent was obtained before random assignment by attending and resident physicians who were trained and qualified to participate in human subject research. The study was sponsored by and conducted at the Kapi'olani Medical Center for Women and Children in Honolulu, HI, from March-July 2011.

One hundred sixty women who were admitted to the Kapi'olani Medical Center for Women and Children labor and delivery unit who desired epidural anesthesia during labor were randomly assigned to 2 groups: continuous indwelling Foley catheterization (CIF) or intermittent catheterization (IC). The following subjects met inclusion criteria: age ≥18 years, singleton gestation, ≥37 weeks 0 days gestation, admitted in spontaneous or for induced labor, and desired epidural analgesia. Exclusion criteria included age <18 years, gestational age <37 weeks 0 days, multiple gestation, declined epidural analgesia, clinical chorioamnionitis at the time of admission, symptoms of urinary tract infection or pyelonephritis, antibiotic usage within 2 weeks of admission, congenital urinary tract abnormalities, HIV/AIDS, lupus, pregestational diabetes mellitus, preeclampsia, or chronic corticosteroid use.

We hypothesized that 25% of the urine cultures from the CIF arm would have bacteriuria and that 15% of the urine cultures from the IC arm would have bacteriuria. This number was chosen on the basis of the rate of postpartum bacteriuria that is reported in the literature, which ranges from 12-28%. One hundred twenty-eight subjects were needed (64 in each group) to detect a 40% difference in the rate of bacteriuria between the 2 groups (power, 0.80; alpha, 0.05). One hundred sixty subjects were assigned randomly to account for dropout and missed specimens. Computer-generated randomization cards were created, placed in opaque envelopes that were labeled solely with the study number, and opened only after consent completion.

We did not collect specific data regarding the type of and dosing of epidural analgesia; however, most subjects received continuous epidural analgesia and a continuous intravenous fluid rate of 100-125 mL/h of lactated Ringers solution or D5 one-half normal saline solution. After epidural placement, the IC group was catheterized every 4 hours and as needed; the CIF group received an indwelling Foley catheter. We chose IC every 4 hours by estimating 0.5-1 mL/kg/h urine output in an average woman who weighed 100 kg and who received intravenous fluids. This equals 200-400 mL in 4 hours; the urge to void occurs at approximately 200-300 mL. Foley catheters were removed in the second stage at the start of pushing, and intermittent catheterizations were stopped at delivery.

Two urine cultures from each subject were submitted for evaluation. The first urine culture (sample 1) was taken from the first catheterization as soon as possible after epidural placement. The second urine culture (sample 2) was taken on