

## Anesthetic Management for Obstetric Hysterectomy: A Multi-institutional Study

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A prospectively designed review of all obstetric hysterectomies performed in five university hospitals between November 1, 1984 and October 31, 1987 has been performed. There were 41,107 deliveries and 46 obstetric hysterectomies, an incidence of 0.11%. Twenty-five hysterectomies were elective and 21 were emergent. The indication for 11 of the 21 emergency hysterectomies was placenta previa and/or accreta. Women in the emergency group had greater intraoperative blood loss, were more likely to have intraoperative hypotension, and were more likely to receive donor blood than women in the elective group ( $P < 0.05$ ). Twelve patients (eight from the elective group and four from the emergency group) received continuous epidural anesthesia, and none required intraoperative induction of general anesthesia. There was no evidence that epidural anesthesia significantly affected blood loss, crystalloid replacement, or requirement for transfusion in the elective group. Abnormal placentation now represents a major indication for emergency obstetric hysterectomy. Furthermore, significant hemorrhage is more likely with emergency obstetric hysterectomy than with elective hysterectomy. Finally, elective cesarean hysterectomy is not a contraindication to performance of continuous epidural anesthesia. (Key words: Anesthesia: obstetric. Anesthetic technique: epidural; general; spinal. Cesarean section. Hysterectomy. Pregnancy.)

THE ROLE of elective cesarean hysterectomy in modern obstetric practice remains controversial. In contrast, in certain situations (e.g., placenta accreta, uterine rupture) there may be no alternative to emergency hysterectomy. Given the infrequent performance of this procedure, few individual anesthesiologists can expect to have extensive experience with the anesthetic management. To our knowledge, there are only two published series of anesthetic management of women undergoing obstetric hysterectomy. In those studies 22%<sup>1</sup> and 28%<sup>2</sup> of women receiving regional anesthesia required intraoperative induction of general anesthesia. The authors questioned

whether regional anesthesia should be given to patients undergoing obstetric hysterectomy.<sup>1,2</sup> We hypothesized that continuous epidural anesthesia represents an appropriate anesthetic option for selected patients undergoing obstetric hysterectomy, especially elective cesarean hysterectomy. The purpose of the present study was to address the following questions: 1) What is the frequency of obstetric hysterectomy in modern obstetric practice? 2) What are the current indications for obstetric hysterectomy? 3) Do elective and emergency hysterectomies incur similar risks for blood loss, transfusion, and other perioperative complications? 4) Does continuous epidural anesthesia represent an appropriate anesthetic option for patients undergoing this procedure?

### Methods

The study was approved by the Institutional Review Board of each of the five participating university hospitals. Each patient had completed at least 24 wk of gestation and underwent obstetric hysterectomy at one of the five hospitals between November 1, 1984 and October 31, 1987. Obstetric hysterectomy was defined as a cesarean hysterectomy or a hysterectomy performed within the first 24 h postpartum. The data were collected prospectively, but the study did not alter patient management. Specifically, the anesthesiologist selected the anesthetic technique for an individual patient.

The data were recorded either during surgery or soon after surgery by manual review of the patient's chart. Specifically, the anesthesiologist recorded the following information on a uniform data sheet: 1) demographic data; 2) indications for cesarean section and/or hysterectomy; 3) details of anesthetic and surgical management; 4) estimated blood loss and the volume of crystalloid and blood products that were given; and 5) intraoperative and postoperative complications. Maternal hypotension was defined as a decrease in the systolic arterial pressure of  $\geq 20\%$  or a systolic arterial pressure of  $< 100$  mmHg. Intraoperative blood loss was defined as the mean of estimates recorded in the anesthetic and operative records. Postoperative febrile morbidity was defined as an oral temperature  $\geq 38.0^\circ$  C on two occasions,  $\geq 4$  h apart,  $> 24$  h after surgery.

Statistical analysis was by Student's *t* test, Wilcoxon test, chi-square, and Fisher exact test as indicated.  $P < 0.05$  was considered significant.

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TABLE 1. Distribution of Cases Between November 1, 1984 and October 31, 1987

	Number of Deliveries	Number of Cesarean Sections	Number of Obstetric Hysterectomies
Forsyth Hospital, Wake Forest University	14,167	4,333 (31%)	16 (0.11%)
Duke University	6,108	1,475 (24%)	12 (0.20%)
University of Florida	8,827	1,882 (21%)	7 (0.08%)
University of North Carolina	5,491	1,153 (21%)	6 (0.11%)
University of Iowa	6,514	1,102 (17%)	5 (0.08%)
Total	41,107	9,945 (24%)	46 (0.11%)

The values in parentheses represent the incidence figures.

### Results

There were 41,107 deliveries and 9,945 cesarean sections at the five participating hospitals during the study period (table 1). There were 46 obstetric hysterectomies, an incidence of 0.11%. Twenty-five hysterectomies were elective and 21 were emergent (table 2). Of the 25 elective cesarean hysterectomies, four were cesarean-radical hysterectomies performed for invasive squamous cell carcinoma of the cervix. Those four cases were excluded from further analysis. (Radical hysterectomy represents a much more extensive dissection than simple hysterectomy. Radical hysterectomy also includes the performance of pelvic and paraaortic lymphadenectomy.) Of the 21 emergency hysterectomies, 17 were performed at the time of cesarean section and four were performed during the first 24 h postpartum. The indication for 11 of the 21 emergency hysterectomies was placenta previa and/or accreta.

The elective and emergency groups were similar with regard to age, race, socioeconomic status, parity, and weight (table 3). Women in the emergency group were more likely to have had a previous cesarean section, but the difference was not statistically significant ( $P = 0.10$ ). Women in the emergency group had a shorter gestation, a lower preoperative hematocrit, and a lower preoperative hemoglobin concentration.

TABLE 2. Primary Indications for Hysterectomy

	Number of Patients
Elective (n = 21)*	
Cervical intraepithelial neoplasia	10
Leiomyoma	8
Abnormal menses	3
Emergency (n = 21)	
Placenta previa and/or accreta	11
Uterine atony	5
Uterine rupture	4
Broad ligament hematoma	1

\* Excluding the four women who underwent cesarean-radical hysterectomy for invasive squamous cell carcinoma of the cervix.

TABLE 3. Maternal Characteristics

	Elective (n = 21)	Emergency (n = 21)	P
Age (yr)*	30 ± 6	30 ± 4	NS
Race			
White	10	10	NS
Black	11	11	
Socioeconomic status			
Private	6	6	NS
Indigent	15	15	
Parity			
Nulliparous	2	2	NS
Parous	19	19	
Previous cesarean section			
None	15	10	0.10
≥1	6	11	
Gestational age (wk)*	38 ± 2	35 ± 4	<0.01
Weight (kg)*	81 ± 17	76 ± 18	NS
Preoperative hematocrit (%)*	35 ± 4	31 ± 6	<0.02
Preoperative hemoglobin (g/dl)*	11.5 ± 1.3	10.3 ± 2.1	<0.05

\* Mean ± SD.

Table 4 includes details regarding anesthetic and operative management. Women in the emergency group had greater intraoperative blood loss and crystalloid replacement, were more likely to have intraoperative hypotension, and were more likely to receive donor blood than women in the elective group. Central venous pressure monitoring was not used in any patient undergoing elective hysterectomy, and it was used intraoperatively in two patients undergoing emergency hysterectomy.

Among the patients who received general anesthesia, all patients in the elective group and 12 of 16 in the emergency group received a halogenated agent (*i.e.*, halothane, enflurane, or isoflurane). Twelve patients (eight from the elective group and four from the emergency group) received continuous epidural anesthesia, but none required intraoperative induction of general anesthesia. One patient in the emergency group received spinal anesthesia for cesarean section, underwent emergency hysterectomy for placenta accreta, and required intraoperative induction of general anesthesia 75 min after the skin incision because of inadequate anesthesia.

Among the women in the elective group who received epidural (n = 8) or general (n = 13) anesthesia, there were no significant differences in estimated blood loss (epidural, 1,450 ± 347 ml *vs.* general, 1,238 ± 416 ml), crystalloid replacement (epidural, 4,087 ± 922 ml *vs.* general, 4,046 ± 1820 ml), incidence of transfusion (epidural, five of eight women *vs.* general, five of 13), or discharge hemoglobin concentration (epidural, 10.3 ± 1.4 g/dl *vs.* general, 9.7 ± 1.3 g/dl). Thus, there was no evidence that epidural anesthesia significantly affected morbidity during elective cesarean hysterectomy.

Table 5 includes details regarding intraoperative and postoperative complications. The infrequent occurrence of most complications precluded meaningful statistical

analysis for most categories. However, women in the emergency group were more likely to have evidence of coagulopathy and had a longer mean hospitalization.

Five infants had a 5-min Apgar score <7. All five infants were delivered preterm (*i.e.*, <37 wk gestation). Four of the five mothers had preoperative bleeding, and all five received general anesthesia for cesarean section and emergency hysterectomy. Four of the five women had abnormal placentation (*i.e.*, placenta previa and/or accreta), and the fifth had a ruptured uterus.

### Discussion

To our knowledge, there are only two published series of anesthetic management of women undergoing obstetric hysterectomy.<sup>1,2</sup> LaPlatney and O'Leary<sup>1</sup> reported a series of 60 patients who underwent either elective (83%) or emergency (17%) cesarean hysterectomy between 1961 and 1966. Eighteen of the women received spinal anesthesia and none received epidural anesthesia. Four (22%) of those 18 women required "augmentation with inhalation anesthesia because of prolonged surgery," and two of those four had aspiration pneumonia. The authors concluded that "prolonged surgery, increased intraoperative complications, excessive blood loss, and need for multiple transfusions all serve as relative contraindications to spinal anesthesia."<sup>1</sup> In contrast, Barclay *et al.*<sup>3</sup> commented that spinal anesthesia was their preferred anesthetic technique for elective cesarean hysterectomy.

Subsequently, Chestnut and Redick<sup>2</sup> reviewed the experience at Duke University between 1972 and 1984 in which 25 women received continuous lumbar epidural anesthesia for elective cesarean hysterectomy. Seven (28%) of those 25 women with initially satisfactory epidural anesthesia required intraoperative induction of general orotracheal anesthesia because of patient discomfort and/or suboptimal operating conditions. The authors offered three reasons why epidural anesthesia may not be sufficient for elective cesarean hysterectomy. First, the operative time for cesarean hysterectomy is almost twice that required for cesarean section alone, predisposing to patient restlessness.<sup>4,5</sup> Second, intraperitoneal manipulation and traction typically exceed that occurring with cesarean section alone, and may result in pain, nausea, and vomiting. Third, "hyperemic pelvic viscera with engorged, edematous vasculature require careful dissection facilitated by a quiet operative field."<sup>2</sup> Thus, it might seem most expedient to opt for general anesthesia for all cases of obstetric hysterectomy.

However, many parturients want to be awake and alert during cesarean delivery. Maintenance of a T-4 sensory level, prophylaxis against nausea and vomiting,<sup>6-9</sup> and judicious sedation should reduce the need for intraoperative induction of general anesthesia. In the present study, no patient who received continuous epidural anesthesia re-

TABLE 4. Anesthetic and Operative Management

	Elective (n = 21)	Emergency (n = 21)	P
Anesthetic technique			
Epidural	8	4	
Spinal	0	1	
General	13	16	
Operative time (min)*	137 ± 55	148 ± 62	NS
Hysterectomy			
Total	21	19	NS
Subtotal	0	2	
Estimated blood loss (ml)*	1,319 ± 396	2,526 ± 1,240	<0.001
Intraoperative hypotension	6 (29%)	13 (62%)	<0.05
Intraoperative crystalloid (ml)*	4,062 ± 1,512	5,374 ± 2,340	<0.05
Transfusion intraoperatively	7 (33%)	17 (81%)	<0.01
Transfusion intraoperatively or postoperatively	10 (48%)	18 (86%)	<0.01
Total units transfused*	1.6 ± 1.9	6.6 ± 5.4	<0.001
Discharge hematocrit (%)*	30 ± 4	30 ± 4	NS
Discharge hemoglobin (g/dl)*	10.0 ± 1.3	10.0 ± 1.3	NS

\* Mean ± SD.

quired intraoperative induction of general anesthesia. The present study suggests that elective cesarean hysterectomy is not a contraindication to administration of continuous epidural anesthesia. Furthermore, we do not withhold epidural anesthesia from normovolemic patients undergoing elective, repeat cesarean section for placenta previa, despite the high risk for placenta accreta and emergency hysterectomy in those patients. At least one study suggested that there may be decreased morbidity associated with epidural anesthesia for certain cases of cesarean hysterectomy. Arcario *et al.*<sup>10</sup> reviewed their experience with anesthetic management of cesarean section in patients

TABLE 5. Intraoperative and Postoperative Complications

	Elective (n = 21)	Emergency (n = 21)	P
Intraoperative complications			
Oophorectomy required	1 (5%)	1 (5%)	NS
Cystotomy	1 (5%)	0	NS
Ureteral injury	1 (5%)	0	NS
Bowel injury	0	0	NS
Postoperative complications			
Atelectasis	0	2 (10%)	NS
Vaginal cuff infection	0	3 (14%)	NS
Pelvic hematoma	0	3 (14%)	NS
Wound infection	0	1 (5%)	NS
Urinary tract infection	2 (10%)	0	NS
Thrombosis	0	0	NS
Disseminated intravascular coagulation	0	4 (19%)	0.05
Repeat laparotomy required	0	1 (5%)	NS
Febrile morbidity	3 (14%)	7 (33%)	NS
Treatment antibiotics given	2 (10%)	6 (29%)	NS
Mortality	0	0	NS
Days in hospital (mean ± SD)	5.5 ± 1.3	7.3 ± 4.3	<0.05

with placenta previa. They noted significantly decreased intraoperative blood loss and fluid replacement in patients who received regional anesthesia compared with those receiving general anesthesia. However, they did not distinguish between elective and emergency procedures, and it is possible that the general anesthesia group included a greater number of patients who had experienced preoperative bleeding and who underwent emergency surgery. In the present study, there was no evidence that epidural anesthesia significantly affected blood loss, crystalloid replacement, or requirement for transfusion during elective cesarean hysterectomy.

In the present study, the indication for emergency hysterectomy in 11 of 21 women was placenta previa and/or accreta. Clark *et al.*<sup>11</sup> stated that "the emergence of placenta accreta as a major indication for hysterectomy is a clear change from the past." They<sup>12</sup> and others<sup>13</sup> have noted that a history of previous cesarean section results in an increased risk of placenta previa. Furthermore, the combination of previous cesarean section and present placenta previa predisposes to placenta accreta.<sup>10-13</sup> Clark *et al.*<sup>11</sup> observed that between 1978 and 1982, 53% of term parturients at their hospital with both a placenta previa and one or more previous cesarean sections subsequently underwent hysterectomy for placenta accreta. Given the recent increase in the performance of cesarean section, physicians can expect to encounter placenta previa/accreta with increased frequency. The use of preoperative ultrasound may help identify those patients with placenta previa and previous cesarean section who will have placenta accreta.<sup>14</sup> Should the placenta extend anteriorly in the region of the old uterine scar, one would expect a high likelihood of placenta accreta. In such cases the anesthesiologist should be prepared for substantial hemorrhage and probable emergency hysterectomy.<sup>10-12</sup> We insert at least two large-gauge iv cannulae, and we ensure that crossmatched blood is readily available at the beginning of surgery.

The present study confirms a high incidence of perioperative blood transfusion with either elective or emergency obstetric hysterectomy. However, we note that five of the ten women in the elective group who received blood had a discharge hematocrit > 36%, and nine of the ten women had a discharge hematocrit  $\geq$  29%. These data suggest that not every transfusion was necessary. Some obstetricians have criticized anesthesiologists for replacing blood milliliter for milliliter during elective cesarean hysterectomy.<sup>15,16</sup> Given that the average blood loss with cesarean section alone is 1,000 ml, the mean blood loss of 1,319 ml in the elective group does not seem excessive. Although concern for transfusion-related complications mandates a conservative attitude toward transfusion, we emphasize that the anesthesiologist should recognize the

potential for substantial hemorrhage during every obstetric hysterectomy.

We conclude that approximately 0.1% of all parturients in our teaching hospitals undergo obstetric hysterectomy. Second, abnormal placentation now represents a major indication for emergency obstetric hysterectomy. Third, significant hemorrhage is more likely with emergency obstetric hysterectomy than with elective hysterectomy. And finally, elective cesarean hysterectomy is not a contraindication to performance of continuous epidural anesthesia.

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