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The Frequency and Complication Rates of Hysterectomy Accompanying Cesarean Delivery

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Abstract

Objective—To estimate the frequency, indications, and complications of cesarean hysterectomy.

Methods—This was a prospective, 2-year observational study at 13 academic medical centers conducted between January 1, 1999 and December 31, 2000 on all women who underwent a hysterectomy at the time of cesarean delivery. Data was abstracted from the medical record by study nurses. The outcomes included procedure frequency, indications, and complications.

Results—A total of 186 cesarean hysterectomies (0.5%) were performed from a cohort of 39,244 women who underwent cesarean delivery. The leading indications for hysterectomy were placenta accreta (38%) and uterine atony (34%). Of the hysterectomy cases with a diagnosis recorded as accreta, 18% accompanied a primary cesarean delivery while 82% had a prior procedure ($p<0.001$). Of the hysterectomy cases with atony recorded as a diagnosis, 59% complicated primary cesarean delivery whereas 41% had a prior cesarean ($p< 0.001$). Major maternal complications of cesarean hysterectomy included transfusion of red blood cells (84%) and other blood products (34%), fever (11%), subsequent laparotomy (4%), ureteral injury (3%), and death (1.6%). Accreta hysterectomy cases were more likely than atony hysterectomy cases to require ureteral stents (14% versus 3%, $p=0.03$) and to instill sterile milk into the bladder (23% versus 8%, $p=0.02$).

Conclusion—The rate of cesarean hysterectomy has declined modestly in the last decade. In spite of the use of effective therapies and procedures to control hemorrhage at cesarean delivery, a small proportion of women continue to require hysterectomy to control hemorrhage from both uterine atony and placenta accreta.

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Background

Cesarean delivery is the most common major operation performed in the United States (1), and hysterectomy may be a life saving adjunctive procedure. Cesarean hysterectomy occurs in the United States at a reported incidence of 7.0-8.3 per 1,000 cesarean deliveries (2,3) and 1.02-1.55 per 1,000 total births (2-5). During the early twentieth century, cesarean hysterectomy was performed primarily to avoid post-operative infection and massive blood loss (6). As the safety of cesarean delivery improved, it then became an accepted method of sterilization (7-11). At present, most cesarean hysterectomies are emergent and are performed to control hemorrhage.

Studies of cesarean hysterectomy are predominantly single center, reviews compiled over many years or decades (7-9). As surgical indications and techniques have evolved over time, these studies may have limited relevance to modern practice. The purpose of this analysis was to estimate the frequency of cesarean hysterectomy, its indications and associated complications in a contemporary, large multi-center prospective, observational study.

Materials and Methods

The Cesarean Registry was a prospective, observational study of the Maternal-Fetal Medicine Units Network of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development. It was designed to assess specific, contemporary issues related to cesarean delivery and was conducted at 13 academic medical centers between January 1, 1999 and December 31, 2000. Approval from the Institutional Review Board at each participating center was obtained. The labor and delivery logbook or computer database at each participating center was screened daily to identify all cesarean deliveries. Medical records were reviewed by trained study nurses. Demographic data, details of the obstetric history, and intra-partum and post-partum information including primary and secondary procedure indications, subsequent complications, and concomitant operative procedures, were recorded. For this study all women who underwent a hysterectomy at the time of delivery were examined. Data forms were entered at each clinical center and transmitted weekly to the data-coordinating center at the George Washington University Biostatistics Center where they were uploaded to a mainframe computer and merged with the existing database. The data were edited, and corrections entered, on a regular basis for missing, out of range, and inconsistent values.

The term “hemorrhage” was assigned whenever any transfusion products were given. Estimated blood loss from the operative note was not collected because of its subjectivity. Instead, the change in hematocrit from preoperative value to the lowest recorded value was used as a surrogate measure. Atony was considered present in any woman who received oxytocic agents including methergine, hemabate or oxytocin for therapeutic rather than prophylactic indications. Placenta accreta was defined clinically as a placenta adherent to the uterine wall that could not be easily separated. Cases of percreta and increta were grouped with placenta accreta. Post-operative fever was defined as any temperature ≥ 100.4 degrees F or ≥ 38 degrees C.

Categorical variables were compared using the chi-square test or the Mantel-Haenszel test of trend as appropriate (12). The 95% confidence intervals for one sample binomial interval estimation were calculated using the Blyth-Still-Casella method (13). Nominal two-sided p-value of less than 0.05 was considered to indicate statistical significance; no adjustments were made for multiple comparisons. SAS software, (SAS Institute, Inc., Cary, NC) and StatXact (Cytel Software, Cambridge, MA) were used for analyses.

Results

There were a total of 184,387 deliveries during the study period of which 39,283 women underwent cesarean delivery with 186 women having cesarean hysterectomies. The overall cesarean section rate was 21.3%. For this analysis, the hysterectomy cohort was obtained after removing 11 patients due to missing data; the hysterectomy could not be confirmed. Women (n=28) who underwent post cesarean hysterectomy (laparotomy performed after the original procedure) were excluded as well. Information about this subset in terms of time interval between cesarean section and hysterectomy, complications/concomitant procedures or indication for hysterectomy was not collected. This resulted in a total of 186 (0.5%) cesarean hysterectomies performed in a cohort of 39,244 women who underwent cesarean delivery, for a frequency of 1 in 211 cesareans. Although not statistically significant (p=0.12), there was a variation in incidence of cesarean hysterectomies among the thirteen academic centers with a range of 1 in 530 (0.2%) to 1 in 119 (0.8%) cesarean deliveries.

The demographic characteristics of the hysterectomy cohort are detailed in Table 1. Interestingly, forty-six percent of hysterectomies occurred in patients with gestational ages less than 37 weeks. Nearly half of these (49%) preterm deliveries were done with a cesarean indication of placenta previa, 36% of the preterm deliveries were primary and 64% were repeat cesarean deliveries. The most common primary indications for hysterectomy in this subset of preterm deliveries were accreta (54%) and atony (20%).

The primary indications for cesarean delivery among all women undergoing cesarean hysterectomy are listed in Table 2. A history of a prior cesarean delivery was a risk factor for hysterectomy. A trend was seen for the risk of hysterectomy as the number of prior cesareans increased; from 0.3% without a prior cesarean to 2.9% with three or more prior procedures ($p < 0.001$ for trend).

The primary indications for hysterectomy are presented in Table 3; the most common were accreta (38%) and atony (34%). Of all women who underwent cesarean delivery and carried these diagnoses only a proportion required hysterectomy. Of the total cohort, about 71% (n=72) of total accreta cases and about 4% (n=81) of total atony required hysterectomy. Of the hysterectomy cases with a diagnosis recorded as accreta, 18% accompanied a primary cesarean delivery while 82% had a prior procedure ($p<0.001$). Of the hysterectomy cases with atony recorded as a diagnosis, 59% complicated primary cesarean delivery whereas 41% had a prior cesarean ($P< 0.001$). Overall, 32% of hysterectomy cases had a placenta previa, and 42 women (23%) had both previa and accreta as risk factors.

The majority of cases (66%) were total hysterectomies. Total hysterectomy was performed in 62% and 63% of the cases with a primary hysterectomy indication of accreta and atony, respectively. The median operative time was 154 minutes (interquartile range, 125 to 191) for all cases and the median maternal length of stay was 5 days (interquartile range 4 to 9). Most women (n=105 or 57%) received general anesthesia, either from the outset or after initial use of regional anesthesia.

Complications observed in the hysterectomy cohort are listed in Table 4. Acute blood loss requiring transfusion was the most common complication. Overall, 84% of hysterectomy patients required transfusion. The average number of units of packed or whole red blood cells given intra-operatively was 4.6 (SD +/- 5.4) while the average number of units given post-operatively was 3.7 (SD +/- 4.0). The median change in hematocrit (from pre-operative value to the lowest recorded post-partum) was 9.1 percent (interquartile range, 4.8 to 13.9). Sixty-four (34%) patients required products beyond whole blood or packed red blood cells. Fresh frozen plasma was administered to 32% of patients; cryoprecipitate to 12%; and platelets to 15%. In addition, drain placement occurred in 22% of patients.

Measures to control hemorrhage and avoid hysterectomy, both medical and surgical, were employed in nearly two thirds of all hysterectomy cases before proceeding with definitive surgery. These included: uterine artery ligation (48%), ovarian artery ligation (20%), uterine packing (6%), hypogastric artery ligation (5%), intramyometrial oxytocin injection (9%), and intrauterine warm saline infusion or the instillation of 400-500 ml of warm saline through a pressure catheter into the uterine cavity to treat uterine atony (14%).

Ureteral injury occurred in 3% of cases. Because of the potential for this type of injury, additional procedures were carried out to prevent or identify them. Of the 18 cystotomies, 13 were intentional. Ureteral stent placement occurred in 8% of patients; with intravenous administration of dye and bladder instillation of sterile milk occurring in 3% and 16% of patients, respectively. Accreta hysterectomy cases were more likely than atony hysterectomy cases to require ureteral stents (14% versus 3%, p=0.03) and to instill sterile milk into the bladder (23% versus 8%, p=0.02). Bowel injuries were identified in only two patients.

There were three maternal deaths among the 186 cases (1.6%). One death was due to cardiopulmonary arrest associated with sickle cell crisis and the other two were attributed to amniotic fluid embolism. All three operations were repeat cesarean deliveries and the primary indications for hysterectomy in each case were accreta, atony, and disseminated intravascular coagulopathy.

Discussion

We have confirmed in this large multi-center observational study that hysterectomy remains an uncommon, but not rare, complication of cesarean delivery, occurring in 0.5% of cesarean deliveries. Differences among centers with respect to frequency of this procedure, while not statistically significant (p=0.12), may represent both differences in population characteristics and/or practice style. Our reported frequency of cesarean hysterectomy (4.7 per 1,000 cesarean deliveries) is somewhat lower than reported 10 to 20 years ago (7.0-8.3 per 1,000 cesarean deliveries) (2,3). Current methods to control hemorrhage, including earlier treatment of uterine atony with prostaglandin agents and increased utilization of selective uterine arterial embolization, may have contributed to this reduction. Only 4% of all atony cases had a hysterectomy whereas 71% of accreta cases had a hysterectomy.

Prior studies have indicated that hysterectomy after cesarean delivery is most often performed to control hemorrhage (2,3,5,14-18). The primary etiology for hemorrhage has varied among these reports. In the 1990's, authors suggested an increasing contribution by accreta, particularly in association with a history previous cesarean deliveries and increasing with higher numbers of prior procedures (3,5,15,19). In contrast, three other contemporary studies reported uterine atony (56%) as the leading reason for cesarean hysterectomy (14,17,18). Maternal morbidity, including the risk for cesarean hysterectomy, in women with multiple repeat cesarean deliveries in this cohort has been reported (20). The risks of accreta and hysterectomy all directly increased with the number of cesarean deliveries.

In our series, accreta was the most common reason (38%) for hysterectomy with atony being nearly as common (34%). With the decline in utilization of vaginal birth after cesarean (VBAC) in the past several years, accreta may rise in frequency as an indicator in the future. Other contemporary published reports had higher rates of accreta. For example, Stanco (3) reported 50% of hysterectomy cases secondary to accreta during an era when fewer elective repeat operations were performed. The condition of accreta may have been under-diagnosed in our cohort due to several factors. The diagnosis of accreta was made clinically in our study; we did not have confirmatory pathology reports. Some cases of atony may have actually been complicated by focal areas of accreta leading to hemorrhage. Finally, we did not include women

(n=28) who underwent post cesarean hysterectomy (laparotomy performed after the original procedure). Each of these may have altered the number of true accreta cases in either a positive or negative way.

Our study confirms that considerable morbidity can be expected following cesarean hysterectomy associated with both atony and accreta. This is in contrast to older studies, descriptions of predominantly elective or non-emergent procedures (4,8,9,11). As the frequency of complications associated with non-emergent cesarean hysterectomy is comparatively low, some have advocated the option of elective cesarean hysterectomy in select cases (21). Direct comparison of elective versus emergent cases in two studies demonstrated that elective cases clearly are associated with less blood loss, febrile morbidity, and shorter operative times (22,23). Our cohort of hysterectomies at the time of cesarean delivery was not divided into elective versus emergent cases. Some of the surgeries may have proceeded in a controlled, planned fashion more like the elective cases described elsewhere.

The most common morbidities of non-elective cesarean hysterectomy are transfusion of either red blood cells or other blood products. Our rate of transfusion (84%) is similar to other studies (3,5,23) as is the mean number of units transfused intra-operatively. We did note fewer cases of febrile morbidity (11%). This was significantly lower than other series (31-50%) (2,8,10); and may reflect the current use of prophylactic antibiotics in practice.

In summary, the rate of cesarean hysterectomy has declined modestly in the last decade. In spite of the use of effective therapies and procedures to control hemorrhage at cesarean delivery, a small proportion of women continue to require hysterectomy to control hemorrhage from both uterine atony and placenta accreta. The present analysis may serve as a reference to health care providers and women in determining risk for cesarean hysterectomy and its attendant complications.

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Table 1

Study Population Characteristics

	Cesarean Hysterectomy Patients (n=186)	Primary Cesarean Deliveries (n=80)	Repeat Cesarean Deliveries (n=106)
Maternal age-years	30.8 ± 6.3	29.5 ± 6.6	31.8 ± 5.9
Body Mass Index at Delivery ≥ 30	100 (58.8)	41 (53.2)	59 (63.4)
Gestational age— weeks ≥ 37 < 37	36.7 ± 3.4 101 (54.3) 85 (45.7)	37.1 ± 3.5 49 (61.3) 31 (38.8)	36.4 ± 3.3 52 (49.1) 54 (50.9)
Birth weight-grams	2911 ± 847	3060 ± 842	2799 ± 838
Parity Nulliparity Multiparity	 34 (18.3) 152 (81.7)	 34 (42.5) 46 (57.5)	 0 (0.0) 106 (100.0)
Married	104 (55.9)	47 (58.8)	57 (53.8)
Smoker during pregnancy	34 (18.3)	17 (21.3)	17 (16.0)
Maternal disease*	40 (21.5)	19 (23.8)	21 (19.8)
Maternal race/ethnicity African-American Caucasian Hispanic Asian Other	 62 (33.3) 59 (31.7) 55 (29.6) 2 (1.1) 8 (4.3)	 21 (26.3) 27 (33.8) 26 (32.5) 1 (1.3) 5 (6.3)	 41 (38.7) 32 (30.2) 29 (27.4) 1 (0.9) 3 (2.8)
Source of medical care payment Non-private Uninsured Private	 75 (40.5) 44 (23.8) 66 (35.7)	 32 (40.0) 20 (25.0) 28 (35.0)	 43 (41.0) 24 (22.9) 38 (36.2)
Prior C/S 0 1 2 ≥3	 80 (43.0) 46 (24.7) 25 (13.4) 35 (18.8)	 80 (100.0) 0 (0.0) 0 (0.0) 0 (0.0)	 0 (0.0) 46 (43.4) 25 (23.6) 35 (33.0)

Data given as n (%) or mean ± SD

* Maternal disease was defined as diabetes, asthma, thyroid disease, seizure disorder, pregestational chronic hypertension treated with medication, renal disease, or connective tissue disease

Table 2

Indications for Cesarean Delivery

Indications	Cearean Hysterectomy Patients (n=186)	Primary Cesarean Deliveries (n=80)	Repeat Cesarean Deliveries (n=106)
Previa	59 (31.7)	18 (22.5)	41 (38.7)
Elective repeat	33 (17.7)	0 (0.00)	33 (31.1)
NRFWB	29 (15.6)	14 (17.5)	15 (14.2)
CPD/FTP	18 (9.7)	15 (18.8)	3 (2.8)
Abruption	9 (4.8)	8 (10.0)	1 (0.9)
Abnormal presentation	9 (4.8)	8 (10.0)	1 (0.9)
Other	29 (15.6)	17 (21.3)	12 (11.3)

Data given as n (%)

NRFWB=Non-reassuring fetal well-being; includes non-reassuring antepartum fetal testing

CPD=Cepahlo-pelvic disproportion

FTP=Failure to progress

Table 3
Indications for Cesarean Hysterectomy

Indication	Overall Number (n=186)	Primary Cesarean Deliveries (n=80)	Repeat Cesarean Deliveries (n=106)
Accreta	71 (38.2)	13 (16.3)	58 (54.7)
Atony	64 (34.4)	42 (52.5)	22 (20.8)
Cervical cancer	13 (7.0)	9 (11.3)	4 (3.8)
Uterine rupture	10 (5.4)	2 (2.5)	8 (7.5)
Leiomyomas	9 (4.8)	6 (7.5)	3 (2.8)
Extension	2 (1.1)	2 (2.5)	0 (0.0)
Other*	17 (9.1)	6 (7.5)	11 (10.4)

Data presented as n (%)

* Extensive adhesions, patient desire, uterine artery laceration, inability to close uterus, diffuse uterine hemorrhage/uncontrolled bleeding.

Table 4

Complications of Cesarean Hysterectomy

Complication	Number (%)	95% Confidence Interval
Transfusion		
Packed or whole red blood cells	156 (83.9)	(77.9 – 88.6)
Fresh frozen plasma	59 (31.7)	(25.1-38.9)
Cryoprecipitate	22 (11.8)	(7.6-17.3)
Platelets	28 (15.1)	(10.2-20.7)
Post-operative fever	21 (11.3)	(7.4-16.4)
Ileus	10 (5.4)	(2.7-9.3)
Exploratory laparotomy	7 (3.8)	(1.8-7.6)
Hospital re-admission	7 (3.8)	(1.8-7.6)
Urinary tract infection	6 (3.2)	(1.4-6.7)
Cuff abscess	5 (2.7)	(1.1-5.8)
Maternal death	3 (1.6)	(0.4-4.6)
Bowel injury	2 (1.1)	(0.2-3.8)
Wound dehiscence	2 (1.1)	(0.2-3.8)
Septic Pelvic Thrombophlebitis	1 (0.5)	(0.03-2.7)
Confirmed DVT	1 (0.5)	(0.03-2.7)