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Cesarean radical hysterectomy for cervical cancer in the United States: a national study of surgical outcomes

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OBJECTIVE:

Cesarean radical hysterectomy (cesarean-RH) is performed at the time of cesarean delivery for pregnant women with early-stage cervical cancer.[1] Cesarean-RH is a rare procedure and has been understudied; population statistics are lacking in the literature. This study examined the characteristics and perioperative outcomes of women with cervical cancer who underwent cesarean-RH.

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STUDY DESIGN:

This is a population-based retrospective study that queried the Healthcare Cost and Utilization Project's National Inpatient Sample from 2007–2015.[2] The study start period of 2007 was chosen because of the distinction detailed surgical approaches for RH (abdominal vs other approaches). The study end period of 2015 was chosen because of the change in the International Classification of Disease coding schema. Cervical cancer cases that had both cesarean delivery and abdominal RH (cesarean-RH group) were compared with cases that had RH alone via laparotomy (open-RH; Supplemental Table). Characteristics associated with cesarean-RH and those associated with perioperative complications during the index admission for RH were assessed by fitting binary logistic regression models (conditional backward) in multivariable analyses. All analyses were based on the weighted model.[2]

RESULTS:

Among 22,551 cases of RH that were performed for cervical cancer during the study period, there were 267 cases (1.2%) of cesarean-RH. When compared with the open-RH group (n=15,420), women in the cesarean-RH group were more likely to be young, to be Hispanic, to have lower household income, and to have Medicaid insurance (all: $P<.001$; Table 1). Hospitals that performed cesarean-RH were more likely to be urban teaching hospitals and to have large bed capacity (both: $P<.001$). The lymphadenectomy rate in the cesarean-RH group was higher compared with the open-RH group (98.1% vs 94.1%; $P=.003$).

Cesarean-RH was associated with longer length of stay (median, 5 vs 4 days) and higher corrected-total charge (median, $67,277 vs $48,016) for the index admission compared with the open-RH group (both: $P<.001$). Women in the cesarean-RH group had a higher perioperative complication rate compared with those in the open-RH group (45.1% vs 32.1%; absolute difference, 13.0%; $P<.001$). On multivariable analysis, cesarean-RH carried an independent 2.5–fold increased risk for perioperative complications compared with open-RH (adjusted-odds ratio, 2.45; 95% confidence interval, 1.89–3.16; $P<.001$; Table 2).

More specifically, compared with open-RH, cesarean-RH was associated with an increased risk of hemorrhage (27.1% vs 13.8%), ileus/small bowel obstruction (15.8% vs 8.8%), and pyelonephritis (1.9% vs 0.1%), but a decreased risk of atelectasis (0% vs 5.6%), wound complications (0% vs 2.5%), and respiratory failure (0% vs 2.4%; all, $P<.05$). Surgical mortality rate was statistically similar between the 2 groups (cesarean-RH vs open-RH groups: 0% vs 0.2%; $P=.999$).

CONCLUSION:

Our analysis confirmed that cesarean-RH is a rare surgical procedure that accounts for approximately 1% of all RH cases. Our study found that cesarean-RH is associated with high surgical morbidity (43–45%), especially in regards to high blood loss.[3-5] Because previous studies have included a limited number of cesarean-RH cases, our analysis with a larger sample size is more informative to outline the detailed characteristics and perioperative outcomes of cesarean-RH. There are several limitations in the database, which include a lack of pathological information (such as histologic type, cancer stage, and

oncologic outcome). The blood loss attributable to the hysterectomy part during cesarean-RH, long-term complications, and neonatal outcome are also not available. Therefore, further studies are warranted to assess the safety and feasibility of this procedure.

Because of the high surgical morbidity, consideration should be given to performing cesarean-RH at 4–6 weeks postpartum, if this expectant delay is feasible.[1] Some experts propose that <3 mm invasion with lymphovascular space invasion (±positive cone margin) as an indication for cesarean-RH, if necessary.[1] Because (1) this prudent consideration of delayed surgery is not based on good-quality evidence and (2) surgical mortality rate, an ultimate outcome measure of surgery, related to cesarean-RH was similar to open-RH, well-balanced assessment and decision-making for cesarean-RH is necessary, given that delayed treatment likely requires a second laparotomy.[6] Most importantly, cesarean-RH should be performed at a tertiary care center with all necessary components of perioperative care, particularly blood products.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1

Patient demographics and inpatient perioperative outcome

	Radical hysterectomy				
Characteristic	**Open (n = 15,420)**	**Cesarean (n = 267)**	***P* value**	**Odds ratio (95% confidence interval)[a]**	***P* value[a]**
Age, y[b]	46.8±12.8	32.9 (±5.1)	<.001	0.87 (0.86–0.89)	<.001
Year, n (%)			.892[c]		
2007–2009	7,260 (47.1)	144 (54.1)			
2010–2012	5,205 (33.8)	57 (21.4)			
2013–2015	2,955 (19.2)	65 (24.4)			
Race/ethnicity, n (%)			<.001		.009[d]
White	7,835 (50.8)	130 (48.9)		1.56 (0.95–2.58)	.082
Black	1,557 (10.1)	19 (7.1)		1	
Hispanic	2,370 (15.4)	72 (27.1)		2.13 (1.26–3.59)	.005
Others	1,424 (9.2)	_[e]		0.82 (0.37–1.83)	.634
Missing	2,234 (14.5)	35 (13.2)		1.42 (0.80–2.53)	.234
Obesity, n (%)			.186		
No	13,854 (89.9)	247 (92.5)			
Yes	1,565 (10.1)	20 (7.5)			
Charlson Index, n (%)			.080		
0	11,035 (71.6)	207 (77.8)			
1–2	2,794 (18.1)	38 (14.3)			
≥3	1,590 (10.3)	21 (7.9)			
Median household income, n (%)			<.0001		<.001[d]
<$39,000	4,135 (26.8)	116 (43.6)		1.80 (1.22–2.63)	.003
$39,000-$47,999	3,649 (23.7)	60 (22.6)		1.15 (0.76–1.74)	0.510
$48,000-$62,999	3,593 (23.3)	39 (14.7)		0.74 (0.47–1.16)	.190
≥$63,000	3,629 (23.5)	41 (15.4)		1	

Radical hysterectomy					
Characteristic	**Open (n = 15,420)**	**Cesarean (n = 267)**	***P* value**	**Odds ratio (95% confidence interval)[a]**	***P* value[a]**
Missing	414 (2.7)	_[e]		2.21 (1.08–4.55)	.031
Primary expected payer, n (%)			<.001		.034[d]
Medicare	1,579 (10.2)	_[e]		1.38 (0.54–3.54)	.502
Medicaid	3,521 (22.8)	111 (41.6)		1.37 (1.03–1.83)	.030
Private including HMO	8,515 (55.2)	127 (47.6)		1	
Others	1,763 (11.4)	24 (9.0)		0.70 (0.44–1.10)	.122
Missing	42 (0.3)	0		Not available	.998
Hospital bed size, n (%)			<.001		
Small/medium	4,061 (26.3)	41 (15.4)		1	
Large	11,201 (72.6)	225 (84.6)		2.01 (1.43–2.83)	<.001
Missing	157 (1.0)	0			
Hospital teaching status, n (%)			.001		
Rural/urban nonteaching	2,941 (19.1)	30 (11.2)		1	
Urban teaching	12,322 (79.9)	237 (88.8)		1.73 (1.17–2.56)	<.001
Missing	157 (1.0)	0			
Hospital region, n (%)			.562		
Northeast	2,312 (15.0)	35 (13.2)			
Midwest	3,401 (22.1)	53 (19.9)			
South	5,872 (38.1)	111 (41.7)			
West	3,834 (24.9)	67 (25.2)			
Lymphadenectomy, n (%)			.003		
No	912 (5.9)	_[e]			
Yes	14,507 (94.1)	261 (98.1)			
Length of stay, d[f]	4 (3–5)	5 (4–6)	<.001		
≤7, n (%)	14,251 (92.4)	219 (82.0)			
>7, n (%)	1,169 (7.6)	48 (18.0)			

	Radical hysterectomy				
Characteristic	**Open (n = 15,420)**	**Cesarean (n = 267)**	***P* value**	**Odds ratio (95% confidence interval)[a]**	***P* value[a]**
Total charge in US dollars[f]					
Uncorrected	37,307 (25,508–54,127)	51,371 (38,677–68,831)	<.001		
Corrected[g]	48,016 (33,209–69,016)	67,277 (49,669–82,357)	<.001		
Complication (any), n (%)			<.001		
No	10,469 (67.9)	146 (54.9)			
Yes	4,951 (32.1)	120 (45.1)			

[a] For multivariable model with a binary logistic regression model (cesarean vs open radical hysterectomy); conditional backward method was used to retain covariates with $P<.05$ level

[b] Values are given as mean±standard deviation

[c] Cochran-Armitage test (examined annual value)

[d] For interaction

[e] Suppressed per the Healthcare Cost and Utilization Project requirement (1–10); total number may not be 15,687 because of weighted values

[f] Values are given as median (interquartile range) or number (percentage per column) is shown: Chi-square test, Fisher exact test, Student *t* test, or Mann-Whitney *U* test for univariable analysis

[g] Corrected for the year 2019 value.

TABLE 2

Multivariable analysis for perioperative complications

Characteristic	Odds ratio (95% confidence interval)	*P* value
Age, y	1.02 (1.01–1.02)	<.001
Race/ethnicity		<.001[a]
White	1	
Black	1.42 (1.26–1.60)	<.001
Hispanic	0.88 (0.79–0.98)	.0020
Others	1.19 (1.05–1.35)	.008
Missing	1.01 (0.91–1.13)	.805
Charlson Index		<.001[a]
0	1	
1–2	2.59 (2.37–2.83)	<.001
≥3	2.69 (2.40–3.01)	<.001
Median household income		<.001[a]
<$39,000	1.09 (0.98–1.21)	.115
$39,000–$47,999	1.01 (0.91–1.13)	.810
$48,000–$62,999	1.12 (1.01–1.25)	.028
≥$63,000	1	
Missing	0.53 (0.41–0.68)	<.001
Primary expected payer		<.001[a]
Medicare	0.99 (0.88–1.12)	.888
Medicaid	1.36 (1.19–1.56)	<.001
Private including HMO	1	
Others	1.17 (1.07–1.28)	.001
Missing	1.16 (0.59–2.26)	.674
Hospital bed size		
Small/medium	1	

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Characteristic	Odds ratio (95% confidence interval)	*P* value
Large	1.09 (1.01–1.18)	.048
Hospital teaching status		
Rural/urban nonteaching	1	
Urban teaching	1.14 (1.04–1.26)	.005
Hospital region		.006[a]
Northeast	1.15 (1.05–1.27)	.004
Midwest	1.20 (1.08–1.35)	.001
South	1.08 (0.96–1.22)	.198
West	1	
Radical hysterectomy type		
Open	1	
Cesarean	2.45 (1.89–3.16)	<.001

Note: A binary logistic regression model for analysis (conditional backward method). All the listed covariates were entered in the final model. Missing cases for hospital bed size and teaching status were not entered in the model because of multicollinearity.

[a]For interaction.