



# Perioperative outcomes of placenta accreta spectrum Cesarean delivery in a hybrid vs labour and delivery operating room

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## To the Editor,

Angiography for placenta accreta spectrum (PAS) Cesarean delivery (CD) is associated with decreased estimated blood loss (EBL);<sup>1</sup> EBL has not previously been reported for PAS surgery in the hybrid (HOR) vs labour and delivery (LDOR) operating rooms.

We performed a retrospective observational study (institutional review board-approved) from January 2016 to October 2020, aiming to compare EBL for CD performed in HOR vs LDOR. All cases of antenatal suspicion of PAS were included, excluding cases of unanticipated intraoperative diagnosis of PAS (ineligible for the HOR).

Emergencies and cases without specified patient request for uterine preservation were performed in the LDOR. The

HOR was used when uterine preservation was requested. Thus, selection bias was minimized. No practice changes were made during the study period. Although women consented to possible hysterectomy, even in LDOR cases, Cesarean hysterectomy is not our default option. Thus, if placental separation was possible with insignificant or surgically controllable hemorrhage, extirpative management to preserve the uterus was attempted. Where a placental separation attempt was considered unsuitable after manual inspection and gentle tug, hysterectomy was performed.<sup>2</sup> Data retrieved from the electronic medical records were analyzed and a logistic regression model assessed confounders for EBL; a  $P$  value  $< 0.05$  was deemed significant. Study variables included age, body mass index, risk factors, and diagnostic criteria for PAS<sup>3</sup> (placenta previa, yes/no; ultrasound signs; prior CD), anesthesia mode, nonemergent surgery, invasive radiology management (catheters placed, balloons inflated, and complications) bleeding and blood management (EBL, blood products transfused) and admission to the intensive care unit (ICU). No *a priori* sample size was calculated.

During the study period, 18 women underwent CD for suspected PAS in the HOR and 11 in the LDOR. The groups were similar except for mean (standard deviation) maternal age, which was 35.8 (4.5) yr in the HR group vs 34.0 (4.0) yr in the LDOR group ( $P = 0.008$ ). In the HOR, all women had planned CD; in the LDOR, 5/11 (46%) women had unplanned CD (earlier than expected) ( $P < 0.001$ ). Risk factors for PAS were similar including placenta previa, prior CD, and antepartum ultrasound signs. The International Federation of Gynecology and Obstetrics classification for PAS cases in the HOR was

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**Table** Perioperative management according to site of surgery: hybrid or labour and delivery operating room

	<i>N</i> = 29	Hybrid operating room <i>N</i> = 18	Labour and delivery operating room <i>N</i> = 11	95% CI of the difference	<i>P</i> value
Hysterectomy, <i>n</i> /total <i>N</i> (%)	5/29 (17%)	2/18 (11%)	3/11 (27%)	-0.12 to 0.47	0.34 <sup>a</sup>
Tranexamic acid, <i>n</i> /total <i>N</i> (%)	17/29 (59%)	11/18 (61%)	6/11 (55%)	-0.26 to 0.39	1.00 <sup>a</sup>
Oxytocin dose (units), mean (SD)	20.1 (15.0)	18.1 (8.9)	23.6 (21.2)	-6.05 to 15.05	0.34 <sup>b</sup>
Ergometrine use, <i>n</i> /total <i>N</i> (%)	16/29 (55%)	9/18 (50%)	7/11 (63%)	-0.22 to 0.43	0.70 <sup>a</sup>
Misoprostol use, <i>n</i> /total <i>N</i> (%)	9/29 (31%)	4/18 (22%)	5/11 (46%)	-0.10 to 0.53	0.24 <sup>a</sup>
Placenta accreta diagnosed by surgeon, <i>n</i> /total <i>N</i> (%)	18/29 (62%)	9/18 (50%)	9/11 (82%)	-0.04 to 0.57	0.13 <sup>c</sup>
Anesthesia mode, <i>n</i> /total <i>N</i> (%)					< 0.001 <sup>c</sup>
General anesthesia only	7/29 (24%)	0/18 (0%)	7/11 (63%)	0.30 to 0.84	
Neuraxial then general anesthesia	10/29 (35%)	7/18 (39%)	3/11 (27%)	-0.23 to 0.40	
Neuraxial anesthesia only	12/29 (41%)	11/18 (61%)	1/11 (9%)	0.16 to 0.72	
Iliac balloons inserted by interventional radiologist, <sup>e</sup> <i>n</i> /total <i>N</i> (%)	18/29 (62%)	18/18 (100%)	Not used		
Balloons inflated by interventional radiologist, <sup>f</sup> <i>n</i> /total <i>N</i> (%)	13/29 (45%)	13/18 (72%)	Not used		
Blood products, <i>n</i> [IQR] (range)					
Packed red cells	0 [0–4]	0 [0–2] (0–6)	4 [0–5] (0–6)		0.04 <sup>d</sup>
Fresh frozen plasma	0 [0–2]	0 [0–0] (0–2)	2 [0–4] (0–6)		0.006 <sup>d</sup>
Cryoprecipitate	0 [0–10]	0 [0–0] (0)	10 [0–10] (0–4)		0.049 <sup>d</sup>
Platelets	0 [0–0]	0 [0–0] (0)	0 [0–6] (0–6)		0.11 <sup>d</sup>
EBL (mL), median [IQR] (range)	1,000 [725–1,500] (300–5000)	800 [500–1,000] (300–5,000)	1500 [1,000–2,500] (800–4,000)		0.004 <sup>d</sup>
Δ hemoglobin (g/dL), mean (SD)	1.4 (1.5)	1.1 (1.4)	1.8 (1.6)	-0.46 to 1.86	0.26 <sup>b</sup>
Extubation at surgery end (GA cases only) <i>n</i> /total <i>N</i> (%)	11/17 (65%)	7/7 (100%)	4/10 (40%)	0.14 to 0.83	0.02 <sup>c</sup>
Length of surgery (min), mean (SD)	89 (47)	104 (49)	65 (32)	4 to 75	0.03 <sup>d</sup>
ICU admission <i>n</i> /total <i>N</i> (%)	8/29 (28%)	2/18 (11%)	6/11 (55%)	0.09 to 0.69	0.03 <sup>a</sup>
LOS (days), median (IQR) [range]	8 (5–14.5) [4–34]	8 (5–11.5) [4–13]	8 (5–21) [5–34]		0.57 <sup>d</sup>

<sup>a</sup> Fisher's exact test<sup>b</sup> Student's *t* test<sup>c</sup> Chi square test<sup>d</sup> Mann–Whitney U test<sup>e</sup> The interventional radiologist was present for the duration of the case including removing balloons and sheaths at the end of surgery<sup>f</sup> The decision to inflate the balloons was at the gynecologists' discretion, following delivery of the neonate, depending on their visual inspection of the placenta and uterus<sup>2</sup>

CI = confidence interval; EBL = estimated blood loss; GA = general anesthesia; ICU = intensive care unit; IQR = interquartile range; LOS = length of hospital stay; OR = operating room; PAS = placenta accreta spectrum; SD = standard deviation

median class 1; one woman had class 2 and two women had class 3b, and all women in the LDOR had class 1.

Women undergoing CD in the HOR had a lower EBL (Table). The logistic regression model showed that delivery in the HOR was associated with an EBL < 1,000 mL (odds ratio, 0.06 95% CI, 0.00 to 0.61; *P* = 0.02); however, this was insignificant in the adjusted model (maternal age, placenta previa, low ultrasound suspicion of PAS, use of neuraxial anesthesia, and nonemergent surgery). There

were three complications with the angiography, comprising one case of thrombus requiring a thrombectomy and two cases of self-limiting groin hematomas. Cases in the HOR had prolonged surgical duration.

Performing CD in the HOR using iliac balloon angiography was associated with reduced EBL, packed red blood cell transfusion, ICU admission, and greater use of neuraxial anesthesia in the unadjusted but not adjusted model.

Occlusive balloons may be placed in the radiology suite, with subsequent transfer to the operating room,<sup>4</sup> or in the HOR.<sup>5</sup> Advantages of the HOR include the single setting for multiple procedures, eliminating risk of potentially dislodging balloons during transfer and minimizing procedural time and potential exposure to anesthetic agents. Nevertheless, HOR may be unavailable in emergencies, requires coordination of multiple disciplines, and may be remote from the neonatal unit.

Study limitations included its retrospective nature. Furthermore, no participants underwent angiography in the invasive radiology suite because of the single setting. This raises questions about the advantage of not needing to transfer patients in the single setting. Also, EBL was assessed quantitatively, although the same surgical team was present in all cases, limiting fluctuation in estimates. It is possible that reduced EBL in HOR cases was due to a lower, albeit not statistically significant, rate of PAS.

The HOR was used for uterine-preserving CD, which may explain the higher age of women in the LDOR group than in the HOR group.

There was no shift in surgery location during the study period; however, since completion of the present analysis, all nonemergent antenatally suspected PAS cases have been performed in the HOR, regardless of desire for uterine preservation.

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