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Ultrasound assessment of postplacental copper intrauterine device position 6 months after placement during cesarean delivery

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ABSTRACT

Objective: The objective was to describe the sonographic position of copper intrauterine devices (IUDs) 6 months after insertion during cesarean delivery.
Study design: This prospective, observational study followed participants who received a copper IUD during cesarean delivery. We performed pelvic examination at 6 weeks and 6 months and sonography at 6 months to determine IUD position. Patients had additional examinations as needed to address complications.
Results: Sixty-nine participants provided outcomes through 6 months: 41 (59%) had correctly positioned IUDs, 21 (30%) had malpositioned intrauterine IUDs, 5 experienced expulsion (3 partial, 2 complete), and 2 had elective removal; 52 (75%) had missing strings. Missing strings at 6 weeks predicted an incorrect IUD position in 22 of 52 participants (positive predictive value 42%), and visible or palpable strings predicted a correct IUD position in 7 of 12 participants (negative predictive value 58%).
Conclusion: Although 59% of copper IUDs placed during cesarean were correctly positioned at 6 months, nearly one third were malpositioned.
Implications: Ultrasound may be indicated for patients receiving a copper IUD during cesarean delivery as checking IUD strings alone does not assure correct placement. Providers offering postpartum IUDs should ensure that appropriate processes for the evaluation and management of devices with missing strings or abnormal position are available to all patients regardless of insurance status.

1. Introduction

With postplacental intrauterine device (IUD) placement, IUD expulsion occurs more often for devices placed within 10 minutes of placental delivery compared to those inserted during postpartum follow-up, or at times unrelated to pregnancy [1]. IUD placement during cesarean delivery (versus vaginal) and use of copper IUDs (versus levonorgestrel) are associated with lower expulsion rates [1,2].

In a prior study, pelvic sonography 6 months postpartum after copper IUD placement during vaginal delivery demonstrated IUD malposition in 15% and partial expulsion in 16% of participants [2]. In this study, we sought to evaluate IUD positional outcomes 6 months after copper IUD placement during cesarean delivery.

2. Materials and methods

We recruited adult English speakers between January 2016 and February 2018 who were at least 18 years of age, had cesarean delivery of a liveborn at 34 weeks 0 days' gestation or greater and received a postplacental (PP) TCu380A IUD through routine obstetric care at the Hospital of the University of Pennsylvania. All participants provided written or verbal informed consent. The University of Pennsylvania Institutional Review Board approved the study.

We obtained clinical data from the delivery, IUD insertion and postpartum visits through medical record review. Participants not completing a routine postpartum visit with their obstetrics provider scheduled a research visit at 6 weeks postpartum, and all had a scheduled research visit at 6 months.

At the 6-week and 6-month evaluations, we performed speculum and bimanual examination to evaluate the presence or absence of IUD strings, and sonography to ascertain device position. We offered participants with a recognized IUD problem same-day contraceptive counseling, IUD removal and initiation of a new contraceptive method, if desired, with standard clinical charges incurred to the participant and their insurer. We also offered referrals and sliding-scale gynecological fees as needed.

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Our primary outcome was the proportion of correctly positioned original PPIUDs at 6 months. Secondary outcomes were expulsion (complete or partial), malposition, perforation and elective removal of original PPIUDs.

We defined partial expulsion as the distal end of the IUD below the internal cervical os on sonography or an IUD protruding through the external os [3]. We considered malposition as an IUD greater than 1 cm below the fundus (low-lying) or in an abnormal intrauterine orientation (axial rotation, transverse rotation, inversion) on transvaginal ultrasonography that did not meet criteria for partial expulsion [2].

To determine our sample size, we estimated that 15% of IUDs would be expelled by 6 months postpartum [4–9]. We selected a sample size of 150 participants to provide a 5% confidence interval (CI) around this expected expulsion percentage. We planned to enroll 200 participants, anticipating 25% loss to follow-up by 6 months.

We performed bivariate analyses to compare characteristics among those with a correct IUD position at 6 months to those with all other known IUD position outcomes and assessed differences between participants who did and did not complete study follow-up. We used one-way analysis of variance or Kruskal–Wallis tests for continuous variables and Fisher's exact test for categorical variables as appropriate.

We managed study data in Research Electronic Data Capture software [10,11] and used Stata 14.2 (StataCorp, College Station, TX, USA) for analysis. We conducted all study activities as registered on ClinicalTrials.gov (NCT02706340).

3. Results

We enrolled 111 participants and had known final IUD position outcomes for 69 participants (Fig. 1). We discontinued recruitment early due to slow enrollment. We observed no significant demographic and baseline medical differences between participants with a correctly positioned IUD at 6 months and those with other IUD outcomes (Table 1). We found no significant differences in baseline characteristics in those who did and did not complete the study (Online Appendix 1).

Forty-one of 69 participants with a known 6-month outcome (59% [95% CI, 47%–71%]) had a correctly positioned device, 21 (30% [95% CI 20%–43%]) had a malpositioned IUD (Table 2), and 52 (75% [95% CI 64%-85%]) had missing strings at 6 weeks postpartum. We observed 5 (7% [95% CI 2%–16%]) expulsions (two complete and three partial). Two participants chose to remove their IUD. No perforations occurred.

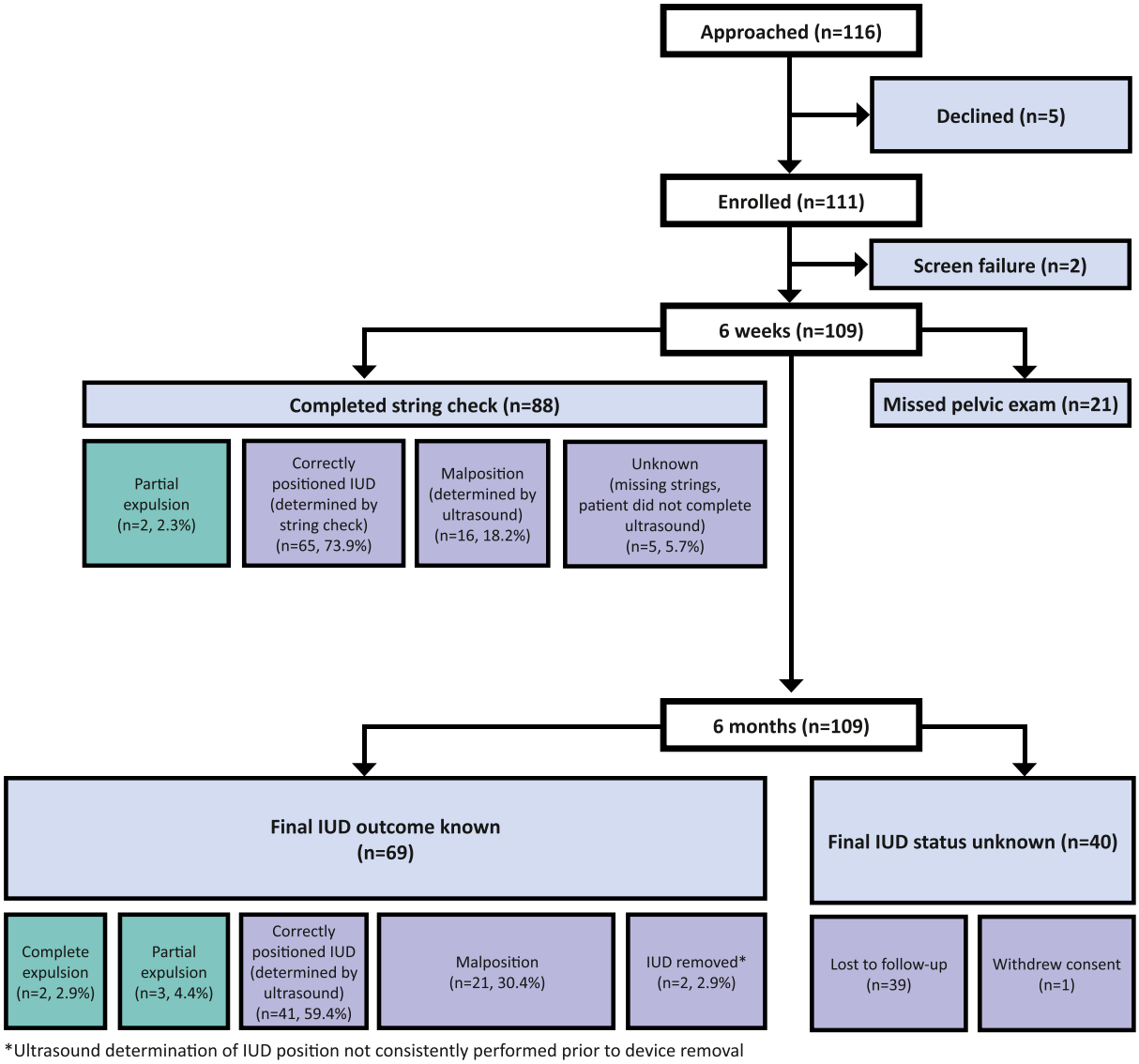

Fig. 1. Study flow: recruitment, enrollment and IUD status of individuals receiving TCu380A IUDs during cesarean delivery.

Table 1
Demographic and baseline characteristics of subjects with TCu380A IUDs placed during cesarean delivery, reported by IUD position at 6 months postpartum

	Total ($N = 109$)	Correct IUD position ($n = 41$)	Other IUD position outcome ($n = 28$)	Outcome unknown ($n = 40$)	p value[a]
Age (years)	27.9 ± 4.8	28.4 ± 5.2	28.5 ± 4.6	27.0 ± 4.8	.84
Race/ethnicity					
Black/African-American	80 (73.4)	27 (65.9)	23 (82.1)	30 (75.0)	.28
White	11 (10.1)	4 (9.8)	2 (7.1)	5 (12.5)	
Other/unknown	18 (16.5)	10 (24.4)	3 (10.7)	5 (12.5)	
Annual household income					
<$10,000	29 (26.6)	8 (19.5)	7 (25.0)	14 (35.0)	.82
$10,000–$30,000	29 (26.6)	14 (34.2)	8 (28.6)	7 (17.5)	
>$30,001	51 (46.8)	19 (46.3)	13 (46.4)	19 (47.5)	
Parity					
1	18 (16.5)	6 (14.6)	5 (17.9)	7 (17.5)	.75
≥2	91 (83.5)	35 (85.4)	23 (82.1)	33 (82.5)	
Relationship status					
Single	41 (37.6)	14 (34.2)	13 (46.4)	14 (35.0)	.52
With partner	34 (31.2)	13 (31.7)	6 (21.4)	15 (37.5)	
Married or divorced	34 (31.2)	14 (34.2)	9 (32.1)	11 (27.5)	
BMI (kg/m^2)					
18–24.9	16 (14.7)	7 (18.0)	4 (14.8)	5 (12.5)	.51
≥25	84 (77.1)	32 (82.1)	23 (85.2)	29 (72.5)	
Gestational age					
Preterm (34 weeks 0 day–36 weeks 6 days)	7 (6.4)	4 (9.8)	2 (7.1)	1 (2.5)	.71
Term (≥37 weeks 0 day)	102 (93.6)	37 (90.2)	26 (92.9)	39 (97.5)	
History of cesarean delivery	75 (68.8)	26 (63.4)	20 (71.4)	29 (72.5)	.61

Data are mean ± standard deviation or *n* (%).
[a] Tests comparing distribution of characteristics for the groups "Correct IUD position" and "Other IUD position outcome."

Missing strings at the 6-week postpartum visit predicted an incorrectly positioned IUD in 22 of 52 participants (positive predictive value 42%), and visible or palpable strings predicted a correctly positioned IUD in 7 of 12 participants (negative predictive value 58%). At the end of the study, 11 (16% [95% CI 8%–27%]) participants continued using a malpositioned or partially expelled PPIUD due to the loss of pregnancy-related health insurance and inability to pay for medical care. No pregnancies occurred.

4. Discussion

In this prospective study of patients who received a copper T380A IUD at the time of cesarean delivery, 59% had a correctly positioned IUD at 6 months postpartum. Only 7% of participants experienced expulsion, but nearly one third had a malpositioned IUD. Our results regarding IUD expulsion are consistent with prior data [5–7,9] but add to the literature by describing multiple intrauterine but abnormal IUD positions. Almost one fifth of participants who completed this study continued using an abnormally oriented IUD due to lost insurance and inability to afford the cost of removal. Given the United States' history of reproductive coercion against marginalized groups [12], facilitation of PPIUD insertion should be balanced with policies that expand access to device removal.

Our study was limited to copper IUDs; IUD position outcomes may differ with levonorgestrel devices [9, 11, 15]. Because we discontinued enrollment early due to slow recruitment and approximately one third of our participants did not complete follow-up, our findings are limited to descriptive outcomes, and we are unable to fully assess predictors of IUD expulsion or the positional abnormalities we observed. Although our small sample demonstrates a low likelihood of IUD expulsion when placed at cesarean delivery, missing strings and abnormal IUD positions are common, which may make removal difficult. Patients must be informed of these possibilities during antenatal counseling, and providers should ensure that outpatient evaluation and management of PPIUDs are available to all patients regardless of insurance status.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.conx.2020.100040.

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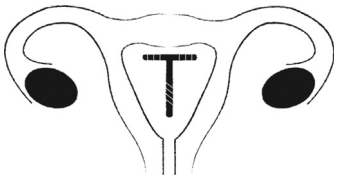
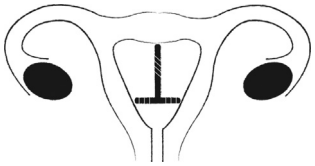
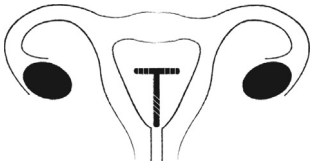
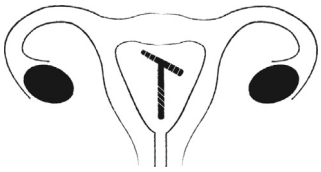
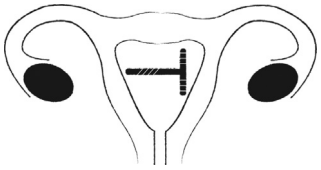
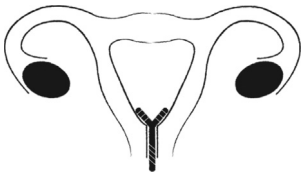
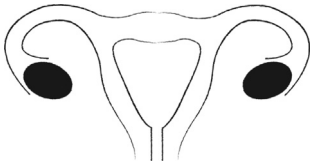
The funding sources and organizations donating intrauterine devices had no role in study design; data collection, analysis or interpretation; manuscript writing; or the decision to submit for publication.

Declaration of competing interests

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Dr. Gurney is a Nexplanon trainer for Merck. Dr. Schreiber is a consultant for Bayer Pharmaceuticals and Athenium Pharmaceuticals and receives research funding from Society of Family Planning, Bayer Pharmaceuticals, Sebela Pharmaceuticals, Medicines360 and the Eunice Kennedy Shriver National Institute of Child Health and Human Development. Dr. Sonalkar receives research funding from

Table 2
Positions of 69 TCu380A IUDs placed immediately after cesarean delivery and at 6 months postpartum

Illustration of IUD position	Description	*n* (%)[a]
	Correct IUD position: in the usual orientation at the uterine fundus.	41 (59.4)
	Inverted: IUD is upside-down within the uterine cavity, with IUD arms oriented toward the lower uterine segment.	6 (8.7)
	Low-lying: IUD is entirely intrauterine (not partially expelled) but ≥1 cm below the fundus.	3 (4.3)
	Axial rotation: IUD is at the fundus in the usual orientation but rotated in the anterior–posterior plane within the uterine cavity.	10 (14.5)
	Transverse rotation: 90° rotation of the IUD, such that IUD stem is extending from cornu to cornu.	2 (2.9)
	Partial expulsion: distal end of the IUD below the internal cervical os on ultrasound or an IUD protruding through the external cervical os on physical exam	3 (4.3)
	Complete expulsion: IUD is completely out of the uterus	2 (2.9)

[a] Denominator to calculate proportions: $n = 69$ (participants with known IUD position outcome assessed with ultrasound).

the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

References

[1] Jatlaoui TC, Whiteman MK, Jeng G, et al. Intrauterine device expulsion after postpartum placement: a systematic review and meta-analysis. Obstet Gynecol. 2018;132:895–905.
[2] Gurney EP, Sonalkar S, McAllister A, Sammel MD, Schreiber CA. Six-month expulsion of postplacental copper intrauterine devices placed after vaginal delivery. Am J Obstet Gynecol. 2018;219(183):e1–9.
[3] Chen BA, Reeves MF, Hayes JL, Hohmann HL, Perriera LK, Creinin MD. Postplacental or delayed insertion of the levonorgestrel intrauterine device after vaginal delivery: a randomized controlled trial. Obstet Gynecol. 2010;116:1079–87.
[4] Levi E, Cantillo E, Ades V, Banks E, Murthy A. Immediate postplacental IUD insertion at cesarean delivery: a prospective cohort study. Contraception. 2012;86:102–5.
[5] Levi EE, Stuart GS, Zerden ML, Garrett JM, Bryant AG. Intrauterine device placement during cesarean delivery and continued use 6 months postpartum: a randomized controlled trial. Obstet Gynecol. 2015;126:5–11.
[6] Celen S, Sucak A, Yildiz Y, Danisman N. Immediate postplacental insertion of an intrauterine contraceptive device during cesarean section. Contraception. 2011;84:240–3.
[7] Hinz EK, Murthy A, Wang B, Ryan N, Ades V. A prospective cohort study comparing expulsion after postplacental insertion: the levonorgestrel versus the copper intrauterine device. Contraception. 2019;100:101–5.
[8] Lester F, Kakaire O, Byamugisha J, et al. Intracesarean insertion of the copper T380A versus 6 weeks postcesarean: a randomized clinical trial. Contraception. 2015;91:198–203.
[9] Colwill AC, Schreiber CA, Sammel MD, Sonalkar S. Six-week retention after postplacental copper intrauterine device placement. Contraception. 2018;97:215–8.
[10] Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: building an international community of software platform partners. Journal of Biomedical Informatics. 2019;95:103208.
[11] Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) — a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009;42:377–81.
[12] Roberts DE. Killing the black body: race, reproduction, and the meaning of liberty. 1st ed. New York: Pantheon Books; 1997.