HHS Public Access

Author manuscript

Contraception. Author manuscript; available in PMC 2020 February 01.

Published in final edited form as:

Contraception. 2019 February ; 99(2): 94–97. doi:10.1016/j.contraception.2018.11.003.

Impact of Training Level on Postplacental Levonorgestrel 52 mg Intrauterine Device Expulsion

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Abstract

Objective: To determine the association between provider training level and postplacental intrauterine device (IUD) outcomes following insertion instruction by email only.

Study Design: We conducted a single-center chart review of demographics, insertion, and clinical outcomes within six months of delivery for 116 patients who underwent postplacental levonorgestrel 52 mg IUD placement from October 1, 2016 to March 31, 2017.

Results: We confirmed IUD retention, removal, or expulsion in 87 of 116 (75.0%) patients by six months after delivery. Complete expulsion or removal for malposition occurred in 20 (23.0%) patients and more frequently after vaginal than cesarean delivery (30.2% vs. 4.2%, OR 9.93 [95% CI 1.25–78.96]) and when a Postgraduate Year (PGY) 1 physician placed the IUD compared to a PGY 2–4 or attending physician (37.5% vs. 14.5%, OR 3.52 [95% CI 1.25–9.94]).

Conclusion: Postplacental levonorgestrel 52 mg IUD expulsion rates are associated with provider training level as well as delivery route, though the individual association of each of these factors is difficult to ascertain given the high degree of collinearity between these two variables in our study.

Keywords

postplacental intrauterine device; postpartum contraception; residency training; IUD expulsion; delivery route

1.0 Introduction

Intrauterine device (IUD) insertion immediately postpartum is safe, convenient, desired by patients, and expands access to long-acting reversible contraception (LARC) [1]. However, the impact of provider training level on postplacental IUD outcomes is not clearly known

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The authors report no conflicts of interest.

[2,3]. Jatlaoui et al [2] found no difference in expulsion rates when comparing insertion by lower (postgraduate [PGY] 1/2) and senior level (PGY 3/4) residents, though the study was underpowered to detect a meaningful difference. Furthermore, postplacental IUD expulsion specifically following placement by PGY 1 physicians, who perform the majority of vaginal deliveries in many training programs and may have less experience in similar clinical skills such as manual removal of the placenta or uterine bimanual massage for hemorrhage, has not been previously reported. Therefore, we conducted a retrospective analysis of a PPIUD initiative at our academic county hospital to explore the clinical and demographic factors associated with PPIUD expulsion, including provider training level completing the placement. We anticipated a higher risk of expulsion for those providers with less training.

2.0 Material and Methods

We performed a retrospective cohort analysis of data collected within a prospective PPIUD initiative conducted at an academic county hospital in Cleveland, Ohio, for deliveries between October 1, 2016 to March 31, 2017. The MetroHealth Medical Center institutional review board approved the study. We introduced the PPIUD initiative via an email to residents and faculty describing inclusion and exclusion criteria, counseling, insertion techniques, and follow-up for PPIUD placement (Appendix 1) [4]. One author (KSA) had experience with PPIUD placement during residency training; no other providers had past training or experience. In patients who desired and consented to placement, the resident physician completing the delivery (with direct attending physician supervision) or the attending physician (if no trainee was available for delivery) inserted the IUD within 10 minutes of placental delivery. We exclusively used a single IUD, the levonorgestrel 52 mg IUD (Liletta®, Medicines360, San Francisco, CA), to eliminate potential outcome differences based on IUD type and due to lower cost.

We reviewed billing reports for all women who had a delivery during the study time frame to identify patients who had a PPIUD placement and confirmed IUD distribution with pharmacy logs. We reviewed delivery records and clinical course from the electronic medical record through six months after delivery. We abstracted demographic data; training status of the provider who inserted the PPIUD; and outcomes including expulsion or removal within six months, need for additional imaging to locate the IUD, and reason for IUD removal. We defined expulsion by either (a) patient report of expulsion as recorded in the electronic medical record or (b) confirmatory imaging with ultrasound or x-ray if the clinician noted no threads at a postpartum examination. We did not explicitly define malposition for study purposes and abstracted the reason for removal based on documentation.

We present results for only women who had confirmation of either retention, removal, or expulsion of the levonorgestrel 52 mg IUD within 6 months of delivery. We compared rates of expulsion and removal for malposition according to clinical and demographic characteristics by Chi-square or Wilcoxon rank sum test, as appropriate, as well as odds ratios with use of the Haldane-Anscombe correction when necessary. We calculated variance inflation factors (VIFs) of all significant associations with expulsion to assess collinearity.

All analyses were two-tailed. We used R software (version 3.4.0) for data analysis [5] and considered a p-value < 0.05 as statistically significant.

3.0 Results

During the six-month study timeframe, 1,506 deliveries occurred with 116 (7.7%) having a PPIUD insertion (Table 1). Physicians placed the IUD either manually (n=101, 87.1%), with a ring forceps (n=8, 6.9%), or with the inserter (n=6, 5.2%); only two (1.7%) procedures included ultrasound guidance.

Within six months of delivery, 87 (75.0%) patients had a documented follow-up assessment with outcomes of retention, removal, or expulsion reported in Table 2. Twenty (23.0%) patients had complete expulsion or IUD removal for malposition. Thirteen (76.5%) expulsions occurred within the first 30 days.

Factors associated with expulsion and removal for malposition are reported in Table 3. Inserter training level was associated with expulsion or removal for malposition across all levels of training (p = 0.002). Regression modeling of the two significant factors (delivery route and provider training level) demonstrated a high degree of collinearity (VIF 15.0 for delivery route and 9.5 for training level) and therefore, multivariable regression was not performed. In the subgroup of those patients with vaginal deliveries, the association between training level and expulsion or removal for malposition was no longer significant (36.7% expulsion when placed by an PGY 1 physician vs. 24.2% expulsion when placed by a PGY 2–4 or attending physician, p=0.42).

4.0 Discussion

We found a combined complete expulsion and removal for malposition rate of 23.0% after initiation of a postplacental levonorgestrel 52 mg IUD placement program at our urban teaching hospital. This rate is similar to or lower than that reported in previously published prospective studies [6–10]. The two risk factors associated with expulsion or removal for malposition identified in our study were vaginal delivery and placement by a PGY 1 physician despite direct attending physician supervision during PPIUD insertion. Possible explanations for the former include lack of advanced cervical dilation for scheduled cesarean deliveries, ease of placing the IUD correctly at the uterine fundus due to ability to palpate the fundus directly, and excellent anesthesia at time of cesarean delivery. In contrast to our findings, one contemporary study has shown no significant difference in expulsion rate between vaginal and cesarean deliveries [10], whereas a different study had similar findings to ours [11]. A systematic review also concluded that expulsion was more common after vaginal rather than cesarean delivery, but included both immediate (within 10 minutes of placental delivery) and early (greater than 10 minutes to less than 4 weeks) in the comparison [12]. However, given the small number of cesareans performed in active labor, we are unable to draw conclusions for laboring women undergoing cesarean delivery.

Previous studies have evaluated the correlation between provider training level and IUD expulsion though have been underpowered to detect a difference or have not studied the resident trainee population specifically [2,3]. The higher expulsion rate of IUDs placed by

PGY 1 physicians after email-only instruction suggests that a formal education program with simulation training (as recommended by the American College of Obstetricians and Gynecologists [13]) targeted to those with less clinical experience in similar intrauterine manipulation might improve expulsion rates for these providers. Importantly, however, there was a high degree of collinearity between the two significantly associated factors of delivery route and provider training level. Furthermore, the association between provider training level and expulsion was not significant in the subgroup of vaginal deliveries, though this study was underpowered to detect a difference for this comparison. Thus, further study is necessary to analyze the relationship between these two factors and PPIUD expulsion.

Our study has limitations including ability to confirm retention or expulsion in only 75% of our cohort, reliance on email-only instruction, and lack of standardized definition or management plan for malposition. As a single IUD was used in the study, our findings may not be generalizable to other IUDs. Moving forward, further analysis of whether expulsion rate varies by provider training level after traditional simulation-based insertion education is warranted.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

The authors wish to thank Lydia Bert, RNC, BSN, MBA, FACHE for her assistance in the implementation of the postplacental IUD initiative.

Funding Disclosure - Dr. Arora is funded by the Clinical and Translational Science Collaborative of Cleveland, KL2TR0002547 from the National Center for Advancing Translational Sciences (NCATS) component of the National Institutes of Health and NIH roadmap for Medical Research. This manuscript is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

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Table 1.

Demographic characteristics of all women undergoing postplacental levonorgestrel 52 mg intrauterine device placement and of those with confirmation of IUD retention, removal, or expulsion at 6 months post-delivery.

	All placements n=116	Placements with Confirmation n=87	p-value
Age (years)	26 (22–30)	27 (23–30)	0.46
Parity	2 (1–3)	2 (1–3)	0.52
BMI (kg/m^2)	32 (27–38)	32 (27–39)	0.46
Race			0.85
Asian	1 (0.9)	1 (1.1)	
Black	50 (43.1)	37 (42.5)	
Hispanic	15 (12.9)	15 (17.2)	
White	47 (40.5)	32 (36.8)	
Other/Unknown	3 (2.6)	1 (1.1)	
Insurance			0.65
Medicaid	99 (85.3)	70 (80.5)	
Private	12 (10.3)	12 (13.8)	
None	5 (4.3)	5 (5.7)	
Education Level			0.92
Grade 12 or less without graduating	40 (34.5)	25 (28.7)	
High school diploma or GED	38 (32.8)	29 (33.3)	
Some college	22 (19.0)	18 (20.7)	
Bachelors degree	8 (6.9)	7 (8.0)	
Graduate degree	5 (4.3)	5 (5.7)	
Unknown	3 (2.6)	1 (1.1)	
Married			0.53
Yes	18 (15.5)	17 (19.5)	
No	97 (83.6)	70 (80.5)	
Unknown	1 (0.9)	0 (0)	
Gestational age at delivery (weeks)	39 (37–39)	39 (37–39)	0.88
Delivery route			0.89
Vaginal	83 (71.6)	63 (72.4)	
Cesarean	33 (28.4)	24 (27.6)	
Provider training level			0.96
PGY 1	42 (36.2)	32 (36.8)	
PGY 2–4	62 (53.4)	32 (36.8)	
Attending	12 (10.3)	8 (9.2)	

Data presented as n (%) or median (interquartile range)

BMI = body-mass index

PGY = Postgraduate year

Table 2.

Outcomes for women with confirmation of either levonorgestrel 52 mg IUD retention, removal, or expulsion.

	Placements with confirmation n=87
Postpartum infection	4 (4.6)
IUD removed	6 (6.9)
Indication for IUD removal	
Malposition without pain	2 (2.3)
Malposition with pain	1 (1.1)
Pain only	2 (2.3)
Bleeding	1 (1.1)
Breastmilk supply concern	1 (1.1)
Postpartum visit within 90 days of discharge	83 (95.4)
Expulsion within six months of discharge [†]	17 (19.5)
Postpartum IUD threads not visible on exam	24[‡] (27.6)
Ultrasound Examination Ordered	13 (14.9)
Examination completed	11 (12.6)

Data presented as n (%)

IUD=intrauterine device

[†]Expulsion defined as either (a) patient report of expulsion as recorded in the electronic medical record or (b) confirmatory imaging with ultrasound or x-ray if no threads were noted at the time of postpartum examination

[‡]14 had expulsions by patient report or ultrasound examination

Table 3.

Factors associated with postplacental levonorgestrel 52 mg intrauterine device (IUD) outcome

	n	Confirmed IUD Expulsion/Removal for Malposition n=20	OR (95% CI)
Parity			0.36 (0.09–1.36)
Primiparous	25	3 (12.0)	
Multiparous	62	17 (27.4)	
Delivery route			**9.93 (1.25–78.96)**
Vaginal	63	19 (30.2)	
Cesarean *	24	1 (4.2)	
Gestational age at delivery			12.10 (0.69211.80)
Preterm (<37 weeks)	15	0	
Term (≥37 weeks)	72	20 (27.8)	
BMI (kg/m^2)			**3.66 (1.11–12.09)**
< 30	36	4 (11.1)	
≥ 30	51	16 (31.4)	
Provider training level			**3.52 (1.25–9.94)**
Attending or PGY 2–4	55	8 (14.5)	
PGY 1	32	12 (37.5)	
Placement method			--
Manual	78	17 (21.8)	
Inserter	3	0	
Ring	5	2 (40.0)	
Unknown	1	1 (100.0)	
Infection	4	0	0.34 (0.02–6.67)
Ultrasound used at time of placement	2	1 (50.0)	3.47 (0.21–58.18)

Data presented as n (%)

BMI = body-mass index

PGY = Postgraduate year

OR = Odds ratio

CI = Confidence interval

* All scheduled cesarean deliveries except one woman in the XX group in active labor