Contraceptive Choices in the Immediate Postpartum Period in Women With Cardiac Disease

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Maternal cardiac disease (MCD) is associated with increased maternal and neonatal morbidity and mortality. Because unplanned pregnancies are especially risky, active use of reliable contraception is critical in this population. Studies in the noncardiac population have demonstrated that the postpartum period is an ideal time to address contraceptive plans. This retrospective cohort study was designed to describe contraceptive choices in women with MCD in the immediate postpartum period and to identify factors associated with specific contraceptive plans. We included women with MCD who delivered from January 2008 to September 2017 at a tertiary care institution with a multidisciplinary obstetrics and cardiology team. Maternal demographics, specifics of MCD, obstetrical outcomes, and contraceptive plans were obtained through chart review. Contraceptive plans were categorized into highly reliable methods (sterilization or long-acting reversible contraceptive methods) or less reliable methods (nonlong-acting reversible contraceptive methods or no contraception). In the 254 women included in this study, 40% planned to use highly reliable methods, while 60% planned to use less reliable methods. Women with cardiomyopathy were more likely to choose a highly reliable method of contraception (adjusted odds ratio 2.6, 95% confidence interval 1.2 to 5.7), a reassuring finding, given the particularly high risk of poor pregnancy outcome with this diagnosis. There were no differences in other cardiac diagnoses between the 2 contraceptive groups. In conclusion, the finding that <50% of postpartum women with MCD plan to use a highly reliable method of contraception warrants further examination to identify and address barriers to reliable contraceptive plans in this high-risk population. **(Am J Cardiol 2019;123:1364−1369)**

Maternal cardiac disease (MCD) in pregnancy is associated with increased maternal and neonatal morbidity and mortality.[1−3] In the United States, cardiovascular conditions and cardiomyopathy together account for the leading cause of maternal mortality, responsible for 26.5% of deaths, translating to a mortality ratio of 4.8 deaths per 100,000 births.[4] Unplanned pregnancies are especially challenging, given the inability to optimize health before conception. Despite the known risks of unplanned pregnancies, they remain common in the MCD population, with 25% to 54% of adult women with congenital heart disease (CHD) reporting unplanned pregnancies.[5−7] Appropriate counseling about and provision of reliable contraception is thus particularly important in this population. Pregnancy presents the ideal opportunity to provide comprehensive contraceptive counseling—preferences, contraindications, and efficacy can be discussed over multiple visits, and a contraceptive plan can be finalized and even initiated in the immediate postpartum period. This method has been shown to prevent unplanned pregnancies and to allow for adequate interpregnancy intervals in the general population.[8] We designed this study to describe contraceptive choices in women with MCD in the immediate postpartum period and to identify factors that are associated with specific contraceptive plans in this high-risk population.

Methods

This was a retrospective cohort study that included all pregnant women with MCD who delivered at the University of California, San Francisco (UCSF) from January 2008 to September 2017. For women who had multiple pregnancies during the study period, only the first pregnancy was included. At this tertiary care institution, pregnant women with MCD are cared for by the multidisciplinary Pregnancy and Cardiac Treatment team, which includes specialists in maternal-fetal medicine (MFM), cardiology, anesthesiology, and nursing. Women cared for by this team include those with cardiomyopathy, CHD, acquired valvular disease, and arrhythmias. Monthly Pregnancy and Cardiac Treatment team meetings are held to review the antepartum, intrapartum, and postpartum management of these patients.

For all deliveries at UCSF, details regarding maternal demographics, labor characteristics, and pregnancy outcomes are collected at the time of delivery by the managing clinicians and stored within the UCSF Perinatal Database. Daily chart review is performed by trained abstractors to

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ensure complete and accurate information, while monthly review of the database is performed by trained physicians for quality assurance. We utilized this database to obtain information regarding maternal demographics, specifics of MCD, and obstetrical outcomes for our cohort of women with MCD. For women with >1 cardiac diagnosis, a single, primary cardiac diagnosis was selected based on clinical review by MFM and cardiology providers. Those with CHD were categorized as nonsevere or severe as previously defined, with severe CHD encompassing tetralogy of Fallot, truncus arteriosus, transposition complexes, endocardial cushion defects, and univentricular physiology.[9] Those without CHD were further categorized as cardiomyopathy (with a prespecified subgroup of dilated cardiomyopathy), acquired valvular disease (with a prespecified subgroup of those with a mechanical valve), pulmonary hypertension, primary arrhythmias (in the absence of other underlying cardiac diagnoses), and others.

The primary outcome of interest was postpartum contraceptive plan. At our institution, documentation of contraceptive plan is required for all patients admitted to the Labor-and-Delivery service. After eliciting this information during admission, postpartum rounds, and/or discharge, managing physicians document the postpartum contraceptive plan in the electronic medical record. Because the UCSF Perinatal Database does not include information regarding contraception, a single MFM physician performed an additional retrospective chart review of admission notes, delivery notes, postpartum progress notes, discharge summaries, inpatient medication administration records, and discharge medication prescriptions for information regarding contraceptive plan at the time of postpartum hospital discharge.

For descriptive purposes, contraceptive plans were separated into 4 categories: (1) sterilization (including female sterilization and male sterilization), (2) long-acting reversible contraceptive (LARC) methods (including copper intrauterine device [IUD], levonorgestrel IUD, and etonogestrel subdermal implant), (3) non-LARC methods (including barrier methods, estrogen-progestin contraceptive pills, progestin-only contraceptive pills, estrogen-progestin contraceptive patch, estrogen-progestin contraceptive vaginal ring, and injectable medroxyprogesterone acetate), and (4) no contraception. Information was also collected about whether the contraceptive plan was initiated before postpartum hospital discharge. This was defined as female sterilization performed before discharge, IUD or subdermal implant inserted before discharge, first dose of medroxyprogesterone acetate administered before discharge, or prescription for pills, patch, or ring provided at the time of discharge.

For statistical analysis, contraceptive plans were further categorized into 2 groups: (1) highly reliable methods (i.e., sterilization or LARC methods) and (2) less reliable methods (i.e., non-LARC methods or no contraception). Chi-squared tests were used for analysis of categorical variables, *t* tests for analysis of continuous variables, and univariable and multivariable logistic regression for unadjusted and adjusted odds ratios with 95% confidence intervals (CI). Statistical analyses were performed using STATA version 13.0 (StataCorp, College Station, Texas). This study was approved by the UCSF Committee on Human Research (study number 10-04360).

Results

During the study period, there were 21,301 deliveries at this institution, 254 of which were complicated by MCD. In the cohort of pregnancies complicated by MCD, the mean maternal age was 31 years (±6), and most of the patients were white (43%), nonobese with body mass index <30 kg/m^2 (80%), and nulliparous (58%). The distribution of MCD diagnoses is summarized in Table 1 and Figure 1. In this population, 40% planned to use a highly reliable method, while 60% planned to use a less reliable method (Figure 2). Specifically, 11% planned to use sterilization, 29% planned to use LARC methods, 29% planned to use non-LARC methods, and 31% had no contraceptive plan at the time of hospital discharge.

Of the 73 women who planned to use a prescription-requiring non-LARC method (contraceptive pill, contraceptive patch, contraceptive ring, or medroxyprogesterone injection), 34% received their chosen method before hospital discharge. Of the 73 women who planned to use a LARC method, 12% underwent device placement before

Table 1
Distribution of cardiac diagnoses among pregnancies complicated by maternal cardiac disease

Cardiac diagnosis	Number of patients
Congenital heart disease (CHD)	126
Non-severe CHD*	76
Severe CHD†	50
Arrhythmias	54
Supraventricular tachycardia	32
Wolff-Parkinson-White syndrome	9
Heart block	8
Atrial fibrillation	4
Ventricular tachycardia	1
Cardiomyopathy	35
Dilated cardiomyopathy	11
Peripartum cardiomyopathy	10
Hypertrophic cardiomyopathy	6
Arrhythmogenic right ventricular dysplasia	2
Other cardiomyopathy‡	6
Acquired valvular disease	25
Mitral valvular disease	22
Prosthetic valve	2
Aortic valvular disease	1
Pulmonary hypertension	5
Other cardiac disease	9
Coronary artery disease	7
Pericardial disease	1
Heart transplant	1

* Nonsevere CHD includes atrial septal defects, ventricular septal defects, aortic coarctation, and congenital valvular anomalies.

† Severe CHD includes tetralogy of Fallot, truncus arteriosus, transposition complexes, endocardial cushion defects, and univentricular physiology.

‡ Other cardiomyopathy includes diastolic dysfunction with preserved left ventricular ejection fraction, history of myocarditis, history of Takotsubo cardiomyopathy, and history of chemotherapy-induced cardiomyopathy.

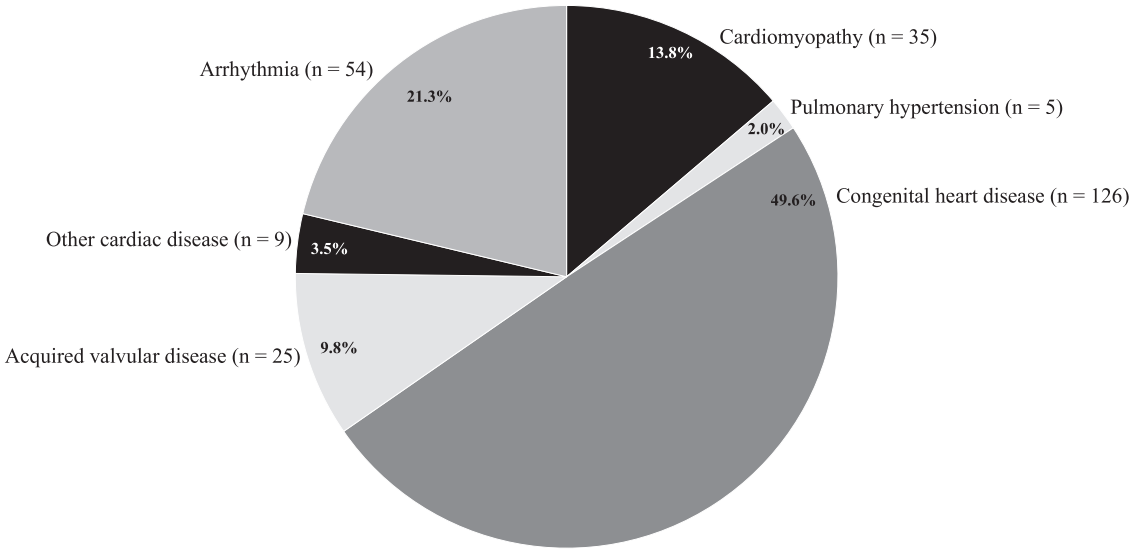

Figure 1. Distribution of cardiac diagnoses among deliveries complicated by maternal cardiac disease at the University of California, San Francisco from January 2008 to September 2017.

discharge. Of the 24 women who planned to use female sterilization, 79% underwent sterilization before discharge.

Associations between contraceptive choices and maternal, cardiac, and pregnancy factors are summarized in Tables 2 and 3. There were no statistically significant differences in maternal age, race, or obesity between those who chose a highly reliable method of contraception and those who chose a less reliable method. There was a significantly higher proportion of multiparous women in the highly reliable group compared to the less reliable group (56% vs 33%, p <0.001).

There were no statistically significant differences in diagnosis of any CHD or diagnosis of severe CHD between the 2 contraceptive groups. There was a significantly higher proportion of women with any cardiomyopathy in the highly reliable group compared with the less reliable group (22% vs 9%, p = 0.003). In univariable logistic regression, a diagnosis of any cardiomyopathy was associated with a threefold increase in the odds of choosing a highly reliable method of contraception (95% CI 1.4 to 6.3). This association persisted after adjusting for age, parity, and mode of delivery (adjusted odds ratios 2.6, 95% CI 1.2 to 5.7). There was also a significantly higher proportion of women with dilated cardiomyopathy in the highly reliable group compared with the less reliable group (8% vs 2%, p = 0.002). In univariable logistic regression, a diagnosis of dilated cardiomyopathy was associated with a more than fourfold increase in the odds of choosing a highly reliable contraceptive (95% CI 1.1 to 16.6), although this association did not persist after adjusting for potential confounders. There were no statistically significant differences in diagnosis of pulmonary hypertension, acquired valvular disease, presence of mechanical valve, or

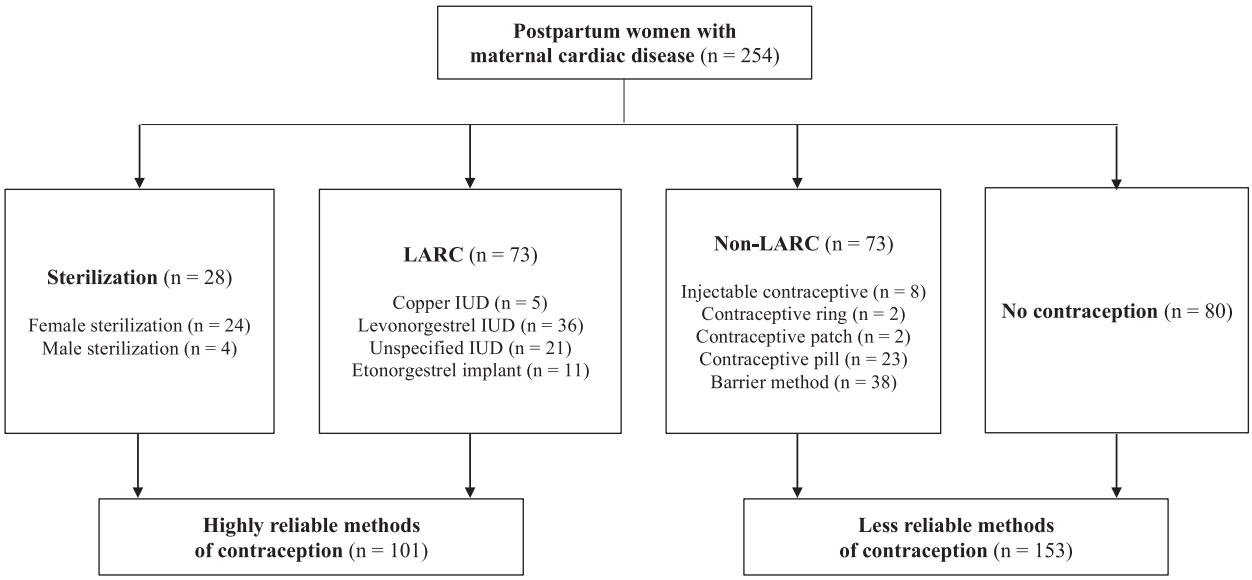

Figure 2. Specific contraceptive plans at the time of postpartum hospital discharge in women with maternal cardiac disease. IUD = intrauterine device; LARC = long-acting reversible contraceptive.

Table 2
Contraceptive plan at time of postpartum hospital discharge in women with maternal cardiac disease

Variable	Highly reliable methods of contraception (n = 101)	Less reliable methods of contraception (n = 153)	p value
Age (years)	30.4 ± 5.9	31.6 ± 5.9	0.09
Race/ethnicity			0.09
White	42 (42%)	68 (44%)	
Black	9 (9%)	15 (10%)	
Hispanic/Latina	25 (25%)	19 (12%)	
Asian	13 (13%)	20 (13%)	
Other	12 (12%)	31 (20%)	
Obese*	23 (26%)	21 (16%)	0.06
Multiparous	56 (56%)	50 (33%)	<0.001
Any congenital heart disease	48 (48%)	78 (51%)	0.59
Severe congenital heart disease	19 (19%)	27 (18%)	0.81
Any cardiomyopathy	22 (22%)	13 (9%)	0.003
Dilated cardiomyopathy	8 (8%)	3 (2%)	0.002
Pulmonary hypertension	3 (3%)	2 (1%)	0.35
Acquired valvular disease	7 (7%)	18 (12%)	0.21
Presence of mechanical valve	1 (1%)	1 (1%)	0.77
Arrhythmia	17 (17%)	37 (24%)	0.16
Preterm delivery <34 weeks	9 (9%)	14 (9%)	0.95
Preterm delivery <37 weeks	24 (24%)	31 (20%)	0.51
Cesarean delivery	39 (39%)	40 (26%)	0.04

Data are presented as n (%) for categorical variables and mean ± standard deviation for continuous variables.
* n = 132 highly reliable group and n = 88 for less reliable group due to missing data regarding body mass index.

arrhythmia, between those who chose a highly reliable method and those who chose a less reliable method.

There were no statistically significant differences in rate of preterm delivery <34 weeks of gestation or preterm delivery <37 weeks of gestation. There was a significantly higher proportion of women with cesarean delivery in the highly reliable group compared with the less reliable group (39% vs 26%, p = 0.04).

Discussion

In this retrospective cohort study examining immediate postpartum contraceptive plans in women with MCD, nearly 2 of 3 of patients elected to use a less reliable method of contraception, defined as a non-LARC method or no contraception. The odds of choosing a highly reliable method were significantly greater with multiparity and with cesarean delivery, findings that have been demonstrated in the general population.[10–12] Cardiomyopathy was the only cardiac-specific factor significantly associated with contraceptive plan in multivariable analysis, with a diagnosis of cardiomyopathy being associated with a >twofold increase in the odds of choosing a highly reliable method. Cardiomyopathy accounts for 11% of maternal deaths and is associated with a high risk of morbidity in pregnancy, which may prompt better provider counseling and/or greater patient motivation to avoid another pregnancy.[4] However, we failed to find any increase in the odds of choosing highly reliable methods in women with other diagnoses that are associated with a particularly high risk in pregnancy, despite reports of greater uptake of highly effective contraception with increasing maternal medical comorbidities in the general population.[12]

Nearly 1 of 3 of women with MCD have no contraceptive plan at discharge, a discouraging albeit unsurprising finding. Other studies examining frequency of contraceptive

Table 3
Unadjusted and adjusted odds ratios of choosing a highly reliable method of contraception over a less reliable method of contraception among women with maternal cardiac disease in the immediate postpartum period

	Unadjusted odds ratio			Adjusted odds ratio		
Cardiac diagnosis	OR	95% CI	p value	OR	95% CI	p value
Any congenital heart disease	0.9	0.5-1.4	0.59	0.9	0.5-1.6	0.79
Severe congenital heart disease	1.1	0.6-2.1	0.81	1.2	0.6-2.4	0.66
Any cardiomyopathy	3.0	1.4-6.3	0.004	2.6	1.2-5.7	0.016
Dilated cardiomyopathy	4.3	1.1-16.6	0.034	3.9	0.9-16.6	0.057
Pulmonary hypertension	2.3	0.4-14.1	0.36	2.0	0.3-12.5	0.48
Any acquired valvular disease	0.6	0.2-1.4	0.21	0.6	0.3-1.7	0.36
Presence of mechanical valve	1.5	0.1-24.6	0.77	3.0	0.2-49.9	0.44
Arrhythmia	0.6	0.3-1.2	0.16	0.6	0.3-1.2	0.15

Adjusted odds ratios are adjusted for age, parity, and mode of delivery.
CI = confidence interval; OR = odds ratio.

use in the CHD population report similarly high rates of no contraceptive use, from 28% to 44%.[13,14] Although our study did not address barriers to reliable contraception, survey studies have demonstrated low rates of patient-reported contraceptive counseling, with 35% to 49% of women with CHD reporting never discussing contraception with any health professional and 54% reporting never receiving cardiac-specific contraceptive counseling.[6,15,16] It is unclear whether this represents inadequate provider counseling, inadequate patient retention, or a combination of both. Provider-related barriers are likely multifactorial. Even in a multidisciplinary setting, the obstetrician may focus on immediate obstetric outcomes, and the cardiologist may focus on cardiac outcomes, leaving little time for either to address long-term contraceptive planning. This can be addressed by improving efforts to educate providers about the importance of contraceptive counseling or by expanding the multidisciplinary approach to include a family planning specialist.[15] Furthermore, providers may be hesitant to offer strong contraceptive recommendations in the absence of high-quality evidence regarding the safety and efficacy of different contraceptive options with specific MCD diagnoses. This can be addressed by developing high-quality prospective and experimental studies examining best contraceptive practices in this high-risk population.

We were surprised to find that the rate of immediate postpartum LARC initiation was low at <15%. Immediate postpartum LARC insertion is safe, cost-effective, and considered best practice by professional societies.[17] Providers should routinely offer immediate postpartum insertion, as this method reduces unplanned pregnancies, improves interpregnancy intervals, and increases long-term LARC continuation.[18] Studies in the general population have identified various barriers to immediate postpartum use, including inadequate training, absence of provider champions, and complex reimbursement schedules.[19] Addressing these barriers may improve immediate postpartum LARC uptake both in the general population and in this MCD population.

It is reassuring that >75% of women who desired female sterilization had the procedure performed before discharge. Those who do not undergo sterilization immediately postpartum must delay sterilization for ≥6 weeks, putting them at risk of experiencing an unplanned pregnancy or being lost to follow-up. The American College of Obstetricians and Gynecologists has identified the postpartum period as the ideal time to perform sterilization and encourages the prioritization of these procedures as urgent rather than elective.[20] For women with MCD, the surgical safety of sterilization should be addressed by a multidisciplinary team of obstetrics, cardiology, and anesthesia providers. In the event that a patient has an unacceptably high surgical risk, alternative methods of highly reliable contraception should be reviewed, including partner vasectomy, which carries a higher safety profile and lower failure rate than female sterilization.[21]

There are some limitations to this study. The retrospective nature of the study limits data collection to what is available in the medical record, and it is possible that nuances of contraceptive counseling and planning were not captured in electronic documentation. Our sample includes a heterogeneous group of patients with MCD seen at a single institution, which may limit applicability to specific MCD diagnoses and generalizability to other institutions. Furthermore, this study examined intended contraceptive plan, rather than actual contraceptive plan. Because many of these patients were referred from providers outside our institution, many ultimately returned to those providers for postpartum care. For those who did not have LARC inserted or sterilization performed before discharge, we were unable to verify which contraceptive plan was ultimately initiated. Similarly, we were unable to verify compliant and regular use of contraception after discharge. Despite these limitations, this study has strengths, including the relatively large sample size and the identification of multiple areas for improvement in contraceptive plans for women with MCD.

The number of women of childbearing age with MCD will continue to increase as advances are made in the long-term management of cardiac disease. Use of highly reliable contraception is imperative to avoid unplanned pregnancies in these patients who are predisposed to increased morbidity and even mortality during pregnancy. The antepartum period is a unique time to provide contraceptive counseling, and the immediate postpartum period is an ideal time to finalize a contraceptive plan and to even initiate reliable contraception. Barriers to highly reliable contraception in the immediate postpartum period must be identified and addressed.

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Disclosures

The investigators have no conflicts of interest to disclose.

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