Contraception in Patients With Heart Failure
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Case Presentation: A 21-year-old woman presented for evaluation and management of heart failure resulting from a familial nondilated cardiomyopathy. A screening echocardiogram demonstrated a left ventricular ejection fraction of 30% to 35% with normal wall thicknesses, chamber sizes, and valvular function. On stress testing, she had good exertional tolerance and contractile reserve, but frequent premature atrial contractions and premature ventricular contractions. She was placed on carvedilol and lisinopril and has not required a diuretic. She was grava 0/para 0, using an etonogestrel/estradiol vaginal ring for contraception, and relayed to us that the nurse practitioner providing her general care questioned the safety of this for her.

Risk of Pregnancy in Patients With Heart Failure
In healthy women, although the health risks of pregnancy have decreased over the past century, contraception still remains safer than pregnancy.1 In making recommendations for contraception in patients with heart failure (HF), we must consider the risks of pregnancy or termination as well as the relative risks and efficacy of the available contraceptive methods. Further, the issue of genetic transmission to the fetus must also be addressed and may be as high as 25% in familial forms of dilated cardiomyopathy and 50% in autosomal dominant conditions such as Marfan syndrome or familial hypertrophic cardiomyopathy.2

In women with a dilated cardiomyopathy (specifically a left ventricular ejection fraction <45%), ≈40% will experience at least 1 cardiac event during pregnancy, including pulmonary edema, arrhythmia, or stroke.3 Furthermore, up to 20% will experience an adverse fetal or neonatal outcome, including intrauterine growth restriction, preterm birth, or delivery of baby that is small for gestational age.3 Patients with peripartum cardiomyopathy after a previous pregnancy present a unique risk associated with future pregnancies. Approximately 50% of patients with peripartum cardiomyopathy will recover their left ventricular (LV) function within 2 to 6 months after their diagnosis.4 In patients who recover their LV function, the literature suggests that, although they do not appear to be at risk for death in future pregnancies, they do have a 20% to 30% risk of pulmonary edema, a 20% risk of >20% decrease in their LV ejection fraction, and a 14% risk of persistent LV dysfunction.5 In patients who do not recover their LV function, risks during future pregnancies are higher, with a 6% to 19% risk of death.3 In addition to the specific risks outlined above, other risks of pregnancy in patients with a cardiomyopathy include the inability to take guideline-indicated medications, such as angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, and warfarin, because of the risk of fetal anomalies.6

In women with valve disease, including severe mitral and aortic stenosis, ≈ one third will experience an arrhythmia, 78% to 100% pulmonary edema, and at least one third will deliver a baby with intrauterine growth restriction or experience preterm labor.7 Maternal deaths and stillbirths have also been reported in this group.7 In patients with congenital heart disease, risks vary widely depending on...
the specific lesion, with maternal death rates being as high as 33% and poor fetal outcomes being common in patients with Eisenmenger syndrome.8

Contraception for Patients With Heart Failure

Given the relative risks of pregnancy, sexually active HF patients should be counseled regarding the use of the safest and most reliable methods of contraception. These methods should be individualized based on the patient’s clinical severity, lifestyle, values, and preferences.

Nonhormonal Contraception

The benefits, risks, and effectiveness of nonhormonal contraceptive methods have been described elsewhere.9 In brief, the benefits of barrier options (such as condoms, diaphragms, caps, and sponges) include relatively low cost and wide availability. Further, condoms specifically offer the added benefit of protection against sexually transmitted infections.10 The risks of barrier methods in the healthy population are low10 and would be expected to be similar in HF patients. Nonhormonal copper intrauterine devices (IUDs) carry a small risk of menstrual irregularities, anemia, pain, and expulsion.11 In HF patients, anemia may worsen symptoms and outcomes, therefore hemoglobin levels should be monitored in patients with excessive bleeding with copper IUDs. Although there is a theoretical risk of infective endocarditis in cardiac patients with the use of IUDs, the American Heart Association no longer recommends infective endocarditis prophylaxis in this population.12

Tubal ligation, a permanent method of birth control, is performed under general anesthesia, abdominally either immediately postpartum via a small abdominal incision, or more commonly via laparoscopy.13 The risks of tubal ligation are therefore likely higher in HF patients than the general population and should be performed in well-compensated patients at centers experienced with this population. Recent technological advances have allowed for a transcervical route of tubal occlusion that avoids abdominal incisions and anesthesia. Chemical methods (quinacrine hydrochloride) have been used widely in developing countries, and 2 mechanical systems implanted under hysteroscopic guidance have been approved by the FDA for use in the United States (Essure [Conceptus; Mountainview, CA] and Adiana [Hologic; Bedford, MA]) with a good safety profile.13,14

With respect to the effectiveness of nonhormonal contraception, partner vasectomy, tubal ligation, transcervical tubal occlusion, and copper IUDs are considered to be the most effective, with <1% rate of unintended pregnancy within the first year.9,14 In contrast, barrier methods have high rates of unintended pregnancies (2% to 27% per year with perfect use and 15% to 32% with typical use). Further, spermicides have an 18% to 29% failure rate in the first year of use.9

Hormonal Contraception

Hormonal contraceptive options include combined estrogen plus progestogen hormonal contraceptives (combined oral contraceptives [COCs], combined transvaginal rings and combined transdermal patches) and progestogen-only forms of contraception (progestogen-only pills, injections [eg, depot medroxyprogesterone acetate], and hormonal IUDs). To date, no prospective randomized trials have addressed the effect of contraceptive hormone use on cardiovascular outcomes, including HF.

Combined Hormonal Contraceptives

Because prescribing guidelines exist for combined hormonal contraceptives (specifically for COCs) in women with elevated cardiovascular risk, we can extrapolate these recommendations to patients with HF, because many of these patients have similar risk factors.9 COCs may cause an increase in blood pressure; therefore, it is recommended that hypertension is well-controlled before initiating a trial of hormone therapy and closely monitored throughout. If a woman has dyslipidemia with a low-density lipoprotein cholesterol >160, alternative nonhormonal methods are recommended. In women with diabetes mellitus type I or II, COC use is only appropriate for healthy women <35 years old. Finally, obesity is an independent risk factor for venous thromboembolism, and nonhormonal contraceptive methods are recommended if the body mass index is >30 kg/m².

In addition to the above recommendations, observational studies in general populations have noted an increased risk of venous thromboembolism in patients on COCs, as well as a small elevated risk of myocardial infarction, particularly in smokers.15 The highest risk of thrombosis appears to occur within the first year of use and is linked to higher doses of estrogen in second generation, and the newer progestogens in the fourth generation hormonal contraceptives.16 HF patients may be at increased risk of venous thromboembolism at baseline because of their frequently sedentary state, and LV thrombus resulting from their dilated ventricle. Therefore, by extension, the risk of thrombosis in HF patients may be increased in patients on COCs. Routes of delivery such as transdermal and vaginal preparations, which avoid first pass metabolism in the liver, may provide a better safety profile17 as first pass metabolism of estrogen increases serum coagulation factors, triglycerides, and C-reactive protein and may lead to an imbalance between procoagulant factors and antithrombotic mechanisms.18 To date, this hypothesis has not been tested in a prospective study, but concern should be raised with any form of combined hormonal contraception with respect to risk in the HF patient.

Arrhythmia with COCs can also occur related to estrogens and progestogens. This is evidenced by the increased risk of cardiac events postpartum in women with long QT syndrome and raises concerns of arrhythmia risk with hormonal contraception.19 Estrogen prolongs the QT by modifying the expression of potassium channels whereas most progestogens shorten the QT, with the exception of the newer fourth generation progestogens.20 In
HF patients who are already at increased risk of atrial and ventricular arrhythmias, the addition of COCs may further increase their risk of a cardiac event.

Little is known about the risks of developing or exacerbating HF from hormonal contraception. Fluid retention is a common listed side effect of COCs and is disadvantageous in this population. The fluid retention is presumably caused by the estrogen component, as progestogens may actually increase secretion of water and sodium.21

Progestogen-Only Forms of Contraception
Progestogen-only forms of contraception in the form of pill, injection, and hormonal IUD would likely not carry as high a risk of fluid retention or thrombotic risk, because these are mostly attributed to the estrogen. However, some risk of thrombosis may still be present, and there has been recent concern over the new progestagen agent, drospirenone, contributing to increased thrombotic risk. Because progestogens can decrease bone mineral density over time, particularly in depot medroxyprogesterone acetate injection forms of progestogens, progestogen-only contraception should be avoided in HF patients with concomitant osteoporosis, osteopenia, or chronic steroid use.

Guidelines on Hormonal Contraception in Cardiovascular Disease
In 2010, the Centers for Disease Control updated the World Health Organization guidelines on the United States Eligibility Criteria for Contraceptive Use.9 Although these guidelines do not contain specific recommendations for patients with HF, they do include recommendations for patients with peripartum cardiomyopathy or valve disease. In patients with a peripartum cardiomyopathy, COCs are not recommended because of the theoretical risks of fluid retention or arrhythmia, whereas progestogen-only pills, IUDs, barrier methods, and depot medroxyprogesterone acetate are all considered reasonable for use. Recommendations are similar for women with complicated valvular heart disease (defined by coexisting atrial fibrillation, pulmonary hypertension, or previous endocarditis) because of their potential increased risk for thrombosis with COCs. In patients with uncomplicated valvular heart disease (without coexisting conditions), they may use any form of contraception, including COCs. The European Society of Cardiology (ESC) also updated their guidelines in 2011 on the management of cardiovascular disease in pregnancy.24 Aside from barrier methods, which are safe but not highly efficacious, these guidelines emphasize the use of sterilization procedures, progestogen-only pills, and IUDs in women with high-risk cardiac conditions.

**Summary and Recommendations**
As noted above, there is a paucity of data regarding contraceptive use for...
women with HF. Efficacy and risks of each available contraceptive option are presented in Figure 1. Given the available information, we have provided an algorithm for consideration of currently available options (Figure 2). When appropriate, partner vasectomy, copper IUDs, or transcervical tubal occlusion are the most effective and carry a relatively low risk, even in the HF patient. Transabdominal tubal ligation involving general anesthesia is contraindicated in a decompensated HF patient; however, it could be considered in a compensated patient under the supervision of an anesthesiologist experienced with cardiac patients. Combined hormonal contraception should generally be avoided because of the potential increase in fluid retention, thrombosis, and arrhythmia. If a hormonal option is contemplated, these risks can be minimized with preferential use of progestogen-only formulations. Barrier methods are least desired (when used alone) because of their low efficacy rates. Condoms should always be considered concurrently for sexually transmitted infection protection.

Although the HF patient presented above was well compensated, her impaired ventricular function and ectopy may increase pregnancy and fetal outcome risks. As mentioned by her nurse practitioner, the combined hormonal contraception method she was using raises her thrombosis and fluid retention risk. In view of her ectopy, there could be additional concerns of exacerbation of arrhythmias. The patient was advised of these issues as well as the risks of pregnancy (including possible worsening of her LV function and fetal anomalies from the angiotensin-converting enzyme inhibitor) and offered access to genetic counseling. For contraception, a non-hormonal IUD was recommended with the option of a low-dose progestogen-only oral agent if she preferred hormonal contraception.

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**Disclosures**

None.

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