

## Prosthetic heart valves and management during pregnancy

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### ABSTRACT

**QUESTION** What are the major concerns during pregnancy for women with prosthetic heart valves?

**ANSWER** There are 2 types of prosthetic heart valves, bioprosthetic and mechanical. Although successful pregnancies are possible for women with prosthetic heart valves, there are potential complications—some of which can be fatal—for both types of valves. Therefore, preconception counseling and assessment are recommended, and care for these patients should be delivered throughout pregnancy in a specialized program for high-risk patients by a multidisciplinary team.

### RÉSUMÉ

**QUESTION** Quelles sont les préoccupations majeures durant la grossesse pour les femmes ayant des valvules cardiaques artificielles?

**RÉPONSE** Il y a 2 genres de prothèses pour les valvules cardiaques: bioprothétiques et mécaniques. Même s'il est possible pour les femmes porteuses de valvules cardiaques artificielles de mener à terme une grossesse, il y a des complications possibles dont certaines peuvent être fatales, quel que soit le type de prothèse. Par conséquent, il est recommandé de faire du counseling et une évaluation avant la conception, et ces patientes devraient être suivies par une équipe multidisciplinaire durant toute la grossesse, dans le cadre d'un programme spécialisé pour les cas à risque élevé.

Valvular heart disease can be acquired or congenital. Although the incidence of rheumatic heart disease is on the decline, the number of patients with congenital heart disease who survive into adulthood has grown substantially over the past 30 years. Therefore, a large number of patients with valvular heart disease will be of childbearing age. Irrespective of the etiology of valvular heart disease, deterioration of the native valve can result in mitral or aortic regurgitation or stenosis, necessitating replacement with a prosthetic valve. There are various types of prosthetic heart valves that can replace the diseased native valve; the 2 main types are bioprosthetic and mechanical. Both bioprosthetic and mechanical valves have many complications—a topic that is too large to cover in this forum. Therefore, this article will review the most serious issues concerning pregnant patients with prosthetic heart valves.

### Bioprosthetic heart valves

Women who have well-functioning bioprosthetic heart valves and who do not have other cardiac risk factors often have uncomplicated pregnancies.<sup>1,2</sup> One advantage of bioprosthetic valves is that they are much less thrombogenic than mechanical valves; however, there is still a risk of thromboembolic complications (see Prevention of thromboembolic complications). The main issues with bioprosthetic valves is their finite lifespan and their risk of structural valve deterioration (SVD).<sup>3</sup>

Serious SVD can require reoperation to replace the failing bioprosthetic valve.<sup>3</sup> Overall, about 50% of women of childbearing age will require valve replacement owing to SVD 10 years after the original operation<sup>3</sup>; therefore, women of childbearing age who have bioprosthetic valves will likely require reoperation.

Reoperation comes with risk,<sup>3</sup> and SVD has been reported to occur both during pregnancy and in the postpartum period, requiring surgery.<sup>1</sup> Young age is one of the known risk factors for SVD.<sup>3</sup> One study found 27% of patients younger than 30 years of age, 77% of patients 30 to 59 years of age, and 85% of patients older than 60 years of age to be free of SVD after 10 years.<sup>4</sup> It should be noted that pregnancy might accelerate SVD.<sup>3</sup> Some studies have found that pregnancy does accelerate SVD<sup>1,5</sup> while other studies have found that it does not.<sup>6-8</sup> This is obviously an unresolved issue<sup>9</sup>; however, the possibility that pregnancy might accelerate SVD does exist and should be discussed with women who have bioprosthetic valves and are pregnant or planning pregnancy.

### Mechanical heart valves

Mechanical valves have excellent durability and SVD does not occur.<sup>3</sup> In addition, newer-generation mechanical valves have superior hemodynamic profiles compared with stented bioprosthetic valves. All mechanical prosthetic valves, however, are thrombogenic and require

lifelong anticoagulation to prevent thromboembolic complications.<sup>3</sup> In addition, pregnancy is a hypercoagulable state. Examples of the types of thromboembolic complications that have occurred during pregnancies associated with mechanical prosthetic valves include stroke, valve thrombosis, and myocardial infarction.<sup>9,10</sup> Choosing which type of anticoagulation to use during pregnancy is problematic, as there is no perfect form available (see Prevention of thromboembolic complications). Therefore, the major concerns associated with pregnant women with mechanical heart valves are thromboembolic complications (including fatal events), maternal bleeding, and increased fetal events.

### Prevention of thromboembolic complications

The types of anticoagulation that can be used during pregnancy include warfarin, unfractionated heparin, and low-molecular-weight heparin (LMWH).<sup>9</sup> However, warfarin is teratogenic,<sup>11</sup> and heparin (both LMWH and unfractionated heparin) is probably less effective than warfarin.<sup>9</sup> The use of warfarin between 6 and 12 weeks' gestational age results in a 6% to 10% risk of embryopathy<sup>10,12-14</sup>; however, the risk is probably lower if less than or equal to 5 mg of warfarin is prescribed.<sup>11</sup> Warfarin increases the risk for maternal hemorrhage and fetal hemorrhage, as it crosses the placenta. At any gestational age, other fetal malformations (probably related to fetal hemorrhage) and higher rates of fetal loss can occur with exposure to warfarin.<sup>12</sup>

In an attempt to avoid the teratogenic effects of warfarin, there have been various strategies for heparin use reported.<sup>9,10,12</sup> The maternal risk of heparin use includes hemorrhage, osteoporosis, heparin-induced thrombocytopenia, and thromboembolic complications.<sup>12</sup> The risk of thromboembolic events during pregnancy in patients treated with heparin is approximately 10%,<sup>1,9</sup> compared with the 3.9% risk with warfarin use throughout pregnancy.<sup>12,13</sup> The use of unfractionated heparin during pregnancy can be problematic, with an attenuated response of activated partial thromboplastin time (aPTT), variable sensitivities of aPTT reagents, and wide peaks or troughs with the use of subcutaneous unfractionated heparin.<sup>9</sup> It should be noted that some of the studies examining the use of unfractionated heparin in pregnancy have failed to achieve appropriate aPTT levels or the levels have not been reported.<sup>9</sup> The use of LMWH has been reported in several papers.<sup>9,10,12</sup> Proper use of LMWH in pregnancy requires very close monitoring of anti-Xa levels, but many of these papers do not provide this information.<sup>10</sup> In addition, the number of patients who receive LMWH and have uncomplicated pregnancies is unknown.<sup>10</sup> Overall, the risk of thromboembolic events reported with a strategy of heparin use during the pregnancy is higher when compared with warfarin use alone throughout the pregnancy. There is no current consensus as to the best approach to anticoagulation

during pregnancy,<sup>10</sup> as there are no large randomized studies to guide decision making.<sup>9</sup>

Most studies have found that the risk of thromboembolic complications is greater with prosthetic valves in the mitral valve position than with those in the aortic position (for both mechanical or bioprosthetic valves).<sup>14</sup> And, irrespective of the valve position, the risk for thromboembolic complications for all prosthetic valves is highest in the first days to months following valve replacement before endothelialization occurs.<sup>14</sup> Thromboembolic complications, however, are much less of a concern for bioprosthetic valves compared with mechanical valves. The risk of a clinical thromboembolism in patients with biologic valves in normal sinus rhythm is 0.7% per year.<sup>14</sup> Patients with bioprosthetic valves and no risk factors for thromboembolic events are often given acetylsalicylic acid as chronic maintenance therapy.<sup>9</sup> Although acetylsalicylic acid is believed to be safe overall in pregnancy,<sup>10,15</sup> there are concerns about its use in the first trimester.<sup>9</sup>

### Maternal endocarditis


All patients with prosthetic heart valves (bioprosthetic or mechanical) are at risk of endocarditis.<sup>16,17</sup> Patients with prosthetic heart valves should receive information about such risk, and preventive measures, such as excellent dental hygiene, should be prescribed.<sup>16,17</sup> The use of antibiotic prophylaxis during delivery is controversial and differs between consensus documents.<sup>16-19</sup> In addition, it is not known if using antibiotics at times of risk prevents endocarditis.<sup>16,17</sup> However, some specialists believe the theoretical benefit of giving antibiotic prophylaxis at the time of delivery outweighs the severe consequences of endocarditis in a high-risk woman, making it a prudent strategy.<sup>16</sup>

### Pregnancy outcomes

There have been several studies looking at the outcome of pregnancies in women with prosthetic heart valves.<sup>1,2</sup> Women with mechanical valves have a higher complication rate, including the increase of both maternal and fetal events,<sup>1,2</sup> compared with women with bioprostheses. Women with bioprostheses who are not using anticoagulation have been found to have excellent fetal outcomes.<sup>1</sup> When compared with women with bioprosthetic valves, women with mechanical heart valves have a higher incidence of pregnancy loss, premature births, maternal deaths, thromboembolic complications, and bleeding.<sup>1,2</sup> Women with bioprosthetic valves, however, have been found to have a higher incidence of structural valve failure,<sup>1,2</sup> often occurring when both mothers and babies are still young.

### Conclusion

Women who have prosthetic heart valves and are of childbearing age should be counseled (ideally before

conception) about the potential issues that might arise during pregnancy. Having a prosthetic heart valve puts both the mother and fetus at risk; therefore, management of these women is required throughout pregnancy in a specialized program for high-risk patients by a multidisciplinary team. 

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**Competing interests**

None declared

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# MOTHERISK

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