Valvular heart disease in women: The surgical perspective

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See related editorial on page 1.

The efforts of many to increase the awareness of cardiovascular disease in women have focused on the primary killer: coronary artery disease. Unlike acquired coronary disease, valvular disease tends to affect women in all age groups and may particularly pose a serious problem in women of childbearing age. Given the simplicity of such screening methods as cardiac auscultation and transthoracic echocardiogram, more women with previously undiagnosed valvular disease can be identified, and guidelines for follow-up and treatment, when necessary, can be recommended. We will review the surgical issues of valvular heart disease that are specific to women during the childbearing and postmenopausal years.

Aortic Valve

Significant aortic stenosis (AS) is not common during the childbearing years. In this age group, stenotic lesions are most commonly congenital in origin in the Western world and are due to rheumatic disease in developing countries. The most common cause of AS in the postmenopausal years is senile calcification that appears in the sixth decade for bicuspid valves or the seventh decade for tricuspid valves. Medical therapy has little role in the management of AS. Any woman with symptoms of AS, including congestive heart failure, syncope, or angina, should have aortic valve replacement (AVR). With improvement in surgical outcomes, there is a trend toward earlier referral for AVR. Asymptomatic women with aortic valve areas 1 cm² or smaller should be considered for AVR, especially younger women who anticipate future pregnancy.

Aortic insufficiency (AI) during the childbearing years is most commonly associated with endocarditis or Marfan syndrome and related connective tissue disorders. In older women with AI the cause is usually hypertensive aortic dilatation or mixed AS/AI lesions of calcific valves. There is a significant role for medical therapy in AI because the risk of sudden death is very low in asymptomatic patients. However, these women require regular surveillance with echocardiography and education for awareness of symptoms. Women with AI are more likely than men to have significant symptoms before ventricular enlargement is noted. Consequently, women more often have class III or IV symptoms at operation and have a similar early outcome but poorer late survival than with men.¹ Because ventricular enlargement is a late finding in women and is associated with poor long-term survival, women with 3+ AI or greater should be considered for AVR only with class II symptoms. Once symptoms are apparent, left ventricular (LV) deterioration may proceed rapidly. Any impairment of LV function, LV dilatation, or an increase in LV end-diastolic pressure warrants thorough evaluation and consideration for AVR.

Generally the issues concerning the choice of valve prosthesis—mechanical versus biologic—are similar with both genders. However, outcomes for AVR vary significantly between men and women.^{1,2} When corrected for body size, women have smaller aortic roots that more often require root enlargement or result in a patient-prosthetic mismatch with incomplete remodeling of the hypertrophic ventricle.^{3,4} Despite a similar degree of LV outflow tract obstruction, women have a smaller end-systolic chamber size, generate higher pressures, and are more likely to have postoperative hypertrophic cardiomyopathy than men.⁵ The 30-day and late mortality after AVR for AS is higher in women,² particularly if concomitant coronary artery bypass grafting is necessary.

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Mitral Valve

Mitral valve prolapse is the most common valvular disease and affects an estimated 6% of all women. It is unusual in its gender-specific age distribution. Mitral valve prolapse is commonly diagnosed in young women, and the incidence decreases dramatically in older women. This differs from the incidence in men, which is relatively constant across all age groups.^{6,7} Approximately 60% of patients with mitral valve prolapse have no symptoms, and most of these will never need treatment. Asymptomatic patients with mitral valve prolapse and more than mild mitral regurgitation should be identified, and appropriate surveillance should be established. Antibiotic prophylaxis for dental or other invasive procedures should be recommended.⁸ Annual examination that reveals a change in murmur or a presentation of dyspnea or chronic fatigue warrants valve interrogation by echocardiogram.

Rheumatic fever is rarely seen today in developed countries; hence, the incidence of mitral stenosis (MS) has decreased except in areas with large immigrant populations. Women comprise more than 70% of MS cases.⁹ Although asymptomatic MS lesions rarely necessitate intervention, women with a mitral valve area of 1.5 cm² or smaller should consider intervention if they plan to have children.

Pregnancy

The interaction between pregnancy and valvular heart disease is complex; each affects the other. The hemodynamic changes that occur during pregnancy are well described. Tachycardia and increased intravascular volume begin in the sixth week and increase rapidly until the fourth or fifth month.¹⁰ Anemia may result from an unbalanced increase in plasma volume over erythrocyte mass. Tachycardia, increased intravascular volume, and increased cardiac output combine to increase the resting gradient across a stenotic valve up to double. These changes increase volume overload on the heart in regurgitant lesions, worsening heart failure symptoms. Previously asymptomatic, undiagnosed valvular lesions may be unmasked by hemodynamic changes in pregnancy. If the valvular lesion is not severe, the patient may be medically managed through her pregnancy, and more definitive therapy may be delayed. However, severe valvular disease threatens the mother's well-being and increases the risk of fetal loss.

Successful valve replacement or repair during pregnancy has been described.¹¹ The use of cardiopulmonary bypass during pregnancy does not increase the maternal mortality risk, but fetal mortality has been reported as 12% to 20%.¹² Teratogenesis risk is greatest in the first trimester, and spontaneous abortion risk is greatest during the third trimester.¹² Therefore, the optimum timing if operation cannot be avoided is during the second trimester.

Successful cardiac operations necessitate preoperative planning and preparation for optimal intraoperative management by the entire heart team. Special concerns include hypothermia during bypass, which can increase the chance of fetal bradycardia and death, and anesthetics, which may have teratogenic effects. The mother's blood pressure needs to be monitored closely during bypass to ensure effective placental perfusion, and the use of a fetal heart monitor is recommended.

Certainly the best option is to address valvular heart disease before pregnancy. Avoidance of pregnancy is an option, but this is not acceptable to many young women. If a valve operation is undertaken during pregnancy, special consideration should be given to the procedure of choice. The preferred option for patients who meet valve structural criteria is balloon valvuloplasty, which may benefit patients with either MS or AS in their second or third trimesters of pregnancy. For those women who are not candidates for valvuloplasty, procedures that do not require long-term anticoagulation are the first choice. Mitral valve repair is favored over replacement.

Warfarin sodium (Coumadin) crosses the placenta with a 15% to 25% incidence of fetal malformations, including facial and digital abnormalities, optic atrophy, and mental impairment. Heparin or low-molecular-weight heparin can be used, but the optimal dosing regimen is unclear. Aspirin therapy alone is probably safe in pregnancy but is less effective in preventing thromboembolic complications.¹³ The safety of other antiplatelet therapy such as ticlopidine, clopidogrel, or glycoprotein IIb/IIIa inhibitors is unproven in pregnancy.

Pregnant women receiving long-term anticoagulation (ie, for prosthetic mechanical valves or atrial fibrillation) may be placed on a regimen of heparin for the first trimester, followed by warfarin. One week before expected delivery, warfarin should be stopped and heparin resumed. Srivastava and colleagues¹⁴ reported an alternative approach after studying 32 pregnancies of mothers who remained on warfarin until the week before anticipated delivery, at which time they were switched to heparin. Of these, 6% had spontaneous abortions, 3% had premature births, and 91% progressed to full term. There were no episodes of thromboembolism or valve thrombosis, and all mothers survived. A skeletal deformity (nasal hypoplasia) was present in 10% of the babies.

Turner Syndrome

Turner syndrome is a genetic abnormality of phenotypic females. The karyotype may be monosomy (45,X), mosaicism of an X chromosome (X/XX or X/XXX), or a structural abnormality of the X chromosome. These women have a higher incidence of cardiovascular anomalies than the general population, with an incidence between 17% and

42%.¹⁵ In the largest reported series,¹⁵ aortic valve disorders were present in 18%. Bicuspid aortic valve was the most prevalent, whereas the incidence of bicuspid aortic valve is 1% to 2% in the general population.¹⁵ Further, tricuspid aortic valves have a higher prevalence of both AI and AS in individuals with Turner syndrome; this is likely related to a mesenchymal defect in the ascending aorta.¹⁶ Echocardiographic screening for valvular disease should be performed with periodic surveillance in all girls diagnosed with Turner syndrome.

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