

PROSTHETIC HEART VALVES

Douglas C. Anderson

INTRODUCTION

Patients with mechanical valve prosthesis (MVP) are at high risk for thromboembolic complications (e.g., cerebrovascular accident [CVA]), and all MVPs require antithrombotic prophylaxis. Bioprosthetic valves are less thrombogenic but not as durable as MVP and are, thus, more prone to failure requiring replacement. An ideal valve, which would be infinitely durable and non-thrombogenic, does not exist.

- Prosthetic valves are made of a broad range of materials that differ in their thrombogenicity.¹
 - Newer materials reduce the thrombogenicity, and future materials such as polymeric may reduce thrombogenicity even more.²
- Valve prosthetics alter cardiac hemodynamics causing turbulence and other flow anomalies.³
 - MVPs in particular create high shear stresses, which destroy blood elements leading to activation of platelets, endothelial cells, and some coagulation proteins, thus resulting in a very high level of thrombogenicity.

Clinical Pearls

- *Since valve position, type, and materials affect thrombogenicity, it is important to determine exactly which valve has been repaired and which prosthesis was used to avoid mistakes in anticoagulation.*

- Thromboembolic events include valve thrombosis, which may necessitate treatment with fibrinolytics or valve replacement, systemic embolism, and stroke.

Clinical Pearls

- *There are a finite number of times a valve can be replaced. After two replacements, careful oversight of anticoagulation is critical to avoid any future replacements.*
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RISK FACTORS FOR THROMBOSIS

- Annual risk for thromboembolism for MVP ranges 4–23% without prophylaxis.^{4,5}
- With prophylaxis, the relative risk of thromboembolic events (TEs) in patients with MVP is reduced to 0.21, or 1–2 per 100 patient years.^{5,6}
- Risk of TE is highest in the early post-surgical period (approximately 3 months) until the valve is fully endothelialized.⁷

Clinical Pearls



- *Transesophageal echocardiography (TEE) is the gold standard for imaging heart valves for thrombosis, and preferred over transthoracic echocardiograms (TTEs) because of higher sensitivity of TEE in detecting thrombi.⁸*

TYPES OF VALVES

Mechanical Prostheses

- Three basic types of mechanical valves: caged ball/disk, tilting disk, and bileaflet (Table 16-1).
- Older caged ball and tilting disk valves are more thrombogenic than bileaflet valves.
- Annual TE event rate in patients who are anticoagulated to an international normalized ratio (INR) 2.5–4.9.⁹
 - Bileaflet 0.5% per year.
 - Tilting disk 0.7% per year.
 - Caged ball 2.5% per year.

TABLE 16-1: Types and Models of Mechanical Valves

Type	Models	Example
Caged-ball	Starr-Edwards	Starr-Edwards ball mitral heart valve (see Figure 16-1)
Tilting disc	Björk-Shiley Monostrut Medtronic Hall Omniscience Omnicarbon Ultracor	Medtronic-Hall valve (see Figure 16-2)
Bileaflet	St. Jude Carbomedics Baxter TEKNA Duromedics Sorin Bicarbon Baxter TEKNA Duromedics Sorin Bicarbon	On-X -ConformX-Aortic valve (see Figure 16-3)