PERCUTANEOUS REPAIR OF MITRAL PARAVALVULAR REGURGITATION

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INTRODUCTION

Surgical replacement with either a mechanical or bioprosthetic valve remains the mainstay for most adult valve disorders. Though long-term prognosis in most cases after surgery is excellent, one possible complication is a paravalvular leak. Paravalvular leaks are leakages around the implanted prosthesis, the reported incidence of which is between 1-5%.[1] Paravalvular leaks are more common with mechanical valves and mitral valves than with bioprosthetic and aortic valves. The incidence of paravalvular leaks after mitral valve replacement is approximately 12.5%. Various factors are thought to contribute to the development of paravalvular leaks shortly after surgery - an incomplete seal between the sewing ring and valve annulus, annular calcification and infection.2 Size of the paravalvular leak usually determines the clinical presentation of the leak. Smaller leaks (<3 mm) are associated with high shear rates and hemolysis, while larger leaks (>6 mm), are associated with significant regurgitation leading to heart failure.3

The major indications for treatment of paravalvular leaks include severe symptoms with valve regurgitation and persistent, severe hemolysis requiring multiple periodic blood transfusions. The current gold standard for treatment of paravalvular leaks is surgery with either replacement or resuturing of the original prosthesis. Reoperation is associated with higher mortality and morbidity than the initial operation, with reported mortality as high as 13%, 15% and 37% following first, second and third procedures, respectively.4 The operative mortality after paravalvular leak surgery is around 7%, and the perioperative stroke rate of 5% with a 10-year Kaplan-Meier survival of 30%. In elderly patients with comorbidities, and in patients with multiple prior chest surgeries, however, the risks of reoperation frequently prohibit surgery. In these patients, percutaneous closure offers an attractive alternative for the treatment of paravalvular leaks, as it is considerably less invasive than surgery and might be associated with fewer risks to the patient.[5-7]

PROCEDURE

The procedure is typically performed under general anesthesia, though it can be performed with local anesthesia as well. The accompanying figure shows the panels depicting the steps in the procedure recently performed in a woman *with* significant mitral paravalvular leak after two prior micral valve replacements, an aortic valve replacement, having recurrent hemolysis, multiple comorbidities and pulmonary hypertension of 70mmHg. Transesophageal echocardiography (TEE) demonstrates the significant mitral paravalvular leak (Panel A). Using a novel 3D imaging modality, the defect and the regurgitant jet en face are visualized, which in this case are crescentric along the anterolateral region of the prosthetic annulus, giving a better orientation of the shape and size of the defect (Panel B). Repair of the mitral paravalvular regurgitation is performed using an antegrade approach with transseptal puncture of the interatrial septum. TEE and fluoroscopy are used to perform the transseptal puncture. Thereafter, a wire is passed across the paravalvular leak again using fluoroscopy and TEE. After measuring the size of the defect with a balloon and TEE (Panel C), an Amplatzer PDA occluder device is used to close the defect (Panel D). After the device is positioned and released, 3 0 imaging (cropped to create a unique lateral 2-chamber perspective) demonstrates the mushroom shape of the deployed occluder against the circular contour of the prosthetic valve annulus (Panel E), which is confirmed with fluoroscopy (Panel F). Significant reduction in paravalvular systolic flow is demonstrated by 2 0 color Doppler (Panel G; compare to Panel A) and by 3D color Doppler (Panel H; compare to Panel B). Closure of the leak dramatically reduced the hemolytic parameters. Symptoms declined from NYHA class III to class II.

Other devices that have been used for percutaneous closure are an Amplatzer septa! occluder and an Amplatzer VSD occluder. A retrograde approach with arterial access is usually used to perform closure of aortic paravalvular leaks. Complications with a percutaneous approach are infrequent, though possibilities are worsening of the leak with valve dehiscence, embolization, bleeding, infection, etc. These complications

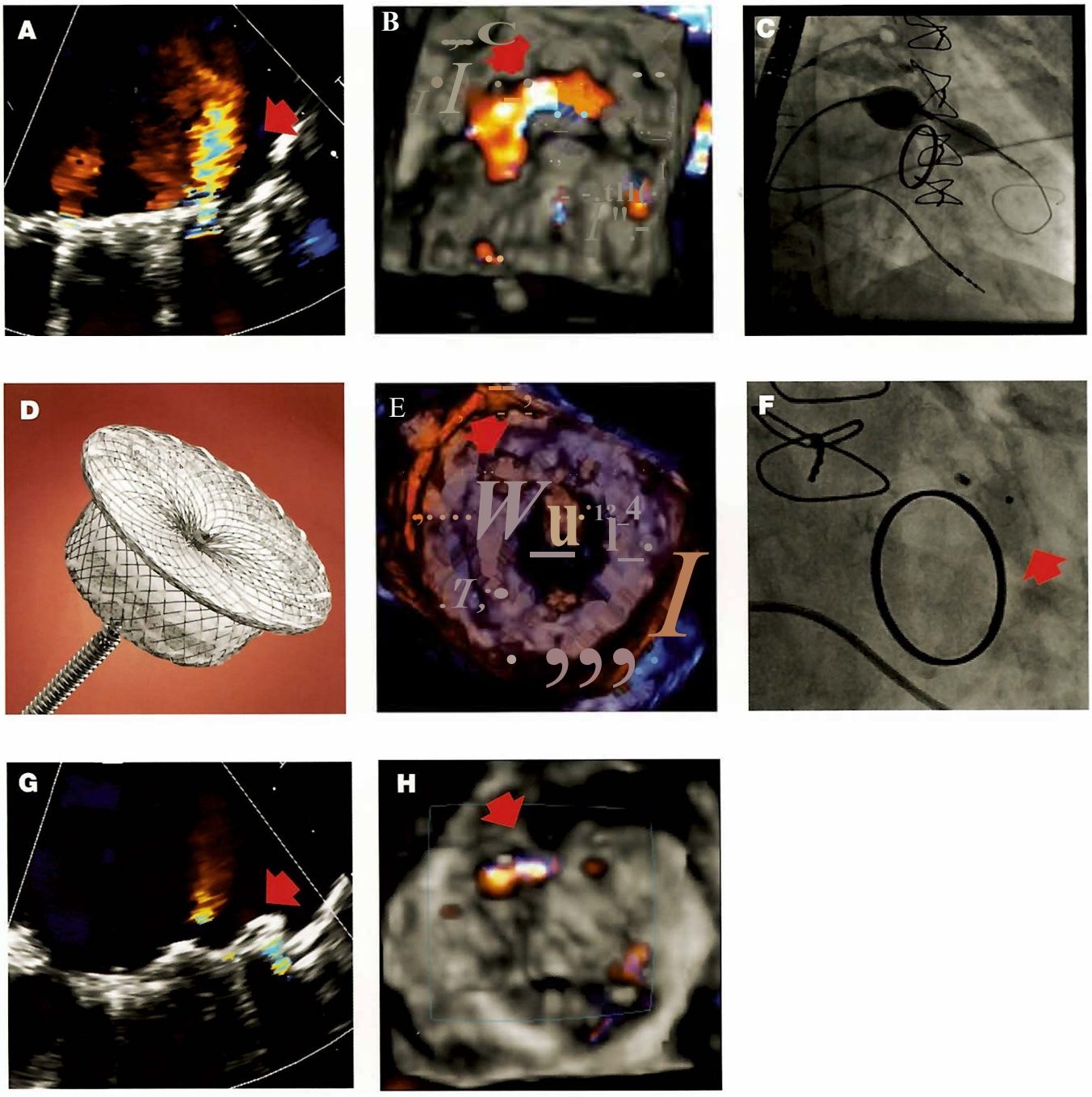

Figure 1. Steps in the percutaneous repair of mitral paravalvular regurgitation procedure performed in a woman with siginificant mitral paravalvular leak after two prior mitral valve replacements and having recurrent hemolysis.

can be minimized when performed by operators experienced in structural heart disease interventions.

CONCLUSION

Percutaneous approaches to paravalvular leak closures, either mitral or aortic, are novel minimally invasive procedures that can be life-saving in patients who are at high risk for surgical correction of prosthetic valvular regurgitation. They are lower-risk alternatives to high-risk valve surgery, that avoid the discomfort and long recovery associated with an open chest surgery.

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