RESEARCH PLAN

A Specific Aims

The goal of this subcontract is to contribute to the development of a Comprehensive Assessment of Valvular Function Using MRI. Valvular heart disease affects approximately 10% of patients with heart disease in the United States. Over the past 20 years, noninvasive valvular diagnosis has undergone a revolution due to advances in cardiac ultrasound. However, ultrasound has inherent limitations with respect to tissue characterization, spatial resolution, and the need for acoustic windows. Particularly challenging are the accurate quantitation of valvular stenosis and identification and quantitation of valvular regurgitation.

An important component of these assessments is the visualization and quantitation of cardiac flow. Real-time color flow MR techniques [1] have led the way towards achieving echocardiography-like frame rates using magnetic resonance. Current limitations of these techniques lie in the ability to visualize and quantify highly localized high-speed flow jets, and complex or turbulent flow patterns.

Our specific aim is to: Improve the visualization and quantitation of valvular function by extending real-time color flow imaging to higher velocities and complex flow. In particular, we will develop and test rapid new phase contrast and fourier velocity encoding imaging sequences in flow phantoms and in human volunteers.

B Background and Significance

Because some degree of valvular incompetence or stenosis is common in all patients with heart disease, a quantitative measure of the degree of the valve dysfunction is critical in assessing the contribution of the valve disorder in a patient’s clinical presentation. Valvular heart disease is defined by structural abnormalities that lead to the pathophysiologic changes of stenosis or regurgitation. Decades of clinical observations and pathologic correlation have established most of the important parameters that are of prognostic or therapeutic importance.

Two of these key factors are valvular gradient pressure which can be derived from peak veloc-

Figure 1: Real-time color flow pulse sequence.

Color Flow: 2-interleaves, 2-images, 120ms, 2.8 mm resolution, 20 cm FOV

Gx
Gy
Gz
RF

Figure 1: Real-time color flow pulse sequence.