CHAPTER 6: THE SPECTRAL DOPPLER EXAMINATION

Routine Measurements

The measurements that can be performed from the DTI trace include the peak e' velocity, the peak a' velocity, the e'/a' ratio, and the peak s' (Fig. 6.10). Most commonly, the e' velocities are routinely measured for the assessment of LV diastolic function (see Chapter 15). The IVRT may also be measured from the DTI signal; however, more commonly the IVRT is measured via spectral Doppler (see Fig. 6.7). Measurement of the s' may be considered for the assessment of LV systolic function; other timing interval measurements can also be measured to calculate the myocardial performance index (MPI) (see Chapter 14).

The normal values for the mitral annular DTI velocities vary according to the sampling site and patient age; in addition, the peak s' also varies with gender. In particular, peak e' at the lateral annulus is normally higher than the e' at the septal (medial) annulus, and the s' velocity is higher in men than in women. The normal values are listed in Table 6.3.

Doppler Examination of Pulmonary Venous Flow

The pulmonary venous flow profile provides important information regarding the hemodynamic events that occur during the cardiac cycle. An understanding of how this flow pattern is produced will allow an easier interpretation of this signal.

Phases relating to Pulmonary Venous Flow

As with all venous flow, pulmonary venous flow is continuous throughout the cardiac cycle; that is, flow occurs throughout diastole and systole. Normal pulmonary venous flow is characterised by three distinct waveforms: (1) systolic forward flow, (2) diastolic forward flow, and (3) atrial flow reversal (Fig. 6.11).

Systolic Forward Flow

Systolic forward flow occurs as a result of LA relaxation and the descent of the mitral annulus toward the cardiac apex with ventricular systole; this flow corresponds to the x descent on the LA pressure curve. Systolic forward flow is biphasic in approximately one third of normal individuals (6-1). In the presence of a biphasic S signal, the first early peak (S1) is related to LA relaxation. LA relaxation lowers the LA pressure which increases pulmonary venous return into the LA. The second peak (S2) which occurs in mid to late systole occurs as the mitral annulus descends toward the cardiac apex with ventricular systole. Pulmonary venous systolic forward flow is closely related to the LA pressure. On the Doppler spectral trace, systolic forward flow is seen to coincide with the T wave of the ECG.

Figure 6.10 Mitral annular Doppler tissue imaging measurements are performed from the septal (medial) annulus (left) and from the lateral annulus (right). Measurements performed include: the peak e’ velocity, the peak a’ velocity, s’/e’ ratio and a’/s’ ratio. The e’/a’ ratio is derived as the peak e’ velocity divided by the peak a’ velocity. Observe that the velocities at the lateral annulus are slightly higher than the velocities at the septal (medial) annulus.