2D LV mass calculations rely on accurate tracing of endocardial and epicardial borders so suboptimal image quality, the inability to identify these borders and off axis images will compromise the accuracy of these calculations. For example, overestimation of LV wall thickness due to oblique cuts through the LV will result in an overestimation of LV mass while underestimation of the LV length due to foreshortening of the apical views will lead to an underestimation of the 2D LV mass. Furthermore, LV mass calculations are based on geometrical assumptions that represent obvious limitations to these calculations.

**LV Systolic and Diastolic Function**

LV systolic and diastolic function in patients with HTN is important due to the structural changes that occur within and surrounding cardiac myocytes which may inhibit normal LV contraction and relaxation. In particular, with long-term HTN heart failure and subsequent LV systolic dysfunction may develop. LV systolic function is assessed in the usual manner (see Chapter 2).

LV systolic function is often hyperdynamic in patients with HTN and this in conjunction with LVH may result in dynamic left ventricular outflow tract (LVOT) obstruction. On the continuous-wave (CW) Doppler signal dynamic LVOT obstruction is identified as a late-peaking systolic, dagger-shaped signal (Fig. 4.10).

The diastolic filling profile in HTN typically reveals an impaired relaxation pattern (Fig. 4.11). A triphasic mitral inflow profile with mid-diastolic flow may also be seen in patients with LVH (Fig. 4.12). When present in the setting of LVH, the L-wave appears to be a marker of pseudonormal LV filling. The proposed mechanism for this mid-diastolic flow (or the L-wave) relates to markedly abnormal LV relaxation. The comprehensive assessment of LV diastolic function is performed in the usual manner (see Chapter 3).

**Figure 4.7** To calculate the LV mass via the area-length method a parasternal short axis of the left ventricle (LV) at the papillary muscle level is acquired at end-diastole (A). Because the mitral valve cannot be seen from this view, end-diastole is identified as the onset of the QRS complex of the ECG. From this image the total epicardial area (A₁) and the total endocardial area (A₂) are traced (B and C). The endocardial area trace includes the papillary muscles, that is, the papillary muscles are included in the cavity area. From these traces and assuming a circular area, the radius (b) is derived as √(A₁/p), where p is the mean wall thickness (t) calculated as √(A₁ - b³ - ½ A₁ L). The LV length (long axis) is measured from the mitral annulus to the LV apex (D). The LV mass can then be calculated via the area-length equation:

\[
LVM (g) = 1.05 \left( \frac{5}{6} A₁ (\sqrt{A₁ - b³} - \frac{1}{2} A₁ L) \right)
\]

**Figure 4.8** To calculate the LV mass via the truncated ellipse method a parasternal short axis of the left ventricle (LV) at the papillary muscle level is acquired at end-diastole (A). Because the mitral valve cannot be seen from this view, end-diastole is identified as the onset of the QRS complex of the ECG. From this image the total epicardial area (A₁) and the total endocardial area (A₂) are traced (B and C). The endocardial area trace includes the papillary muscles; that is, the papillary muscles are included in the cavity area. From these traces and assuming a circular area, the radius (b) is derived as √(A₁/p) and the mean wall thickness (t) is calculated as √(A₁ - b³). From an end-diastolic frame acquired from the apical 4-chamber view, the LV length (long axis) is measured from the mitral annulus to the LV apex (D). The LV mass can then be calculated via the truncated ellipse equation:

\[
LVM (g) = 1.05 \left( \frac{5}{6} A₁ (\sqrt{A₁ - b³} - \frac{1}{2} A₁ L) \right)
\]