In particular, perforation of the anterior mitral leaflet may occur secondary to aortic valve IE whereby the infected AR jet infects the anterior mitral leaflet. On the echocardiographic examination, leaflet perforation is identified by a focal defect within the leaflet with the regurgitant jet passing through this defect (Fig. 13.12).

Leaflet perforation should be suspected when the regurgitant jet is located away from the site of leaflet coaptation.

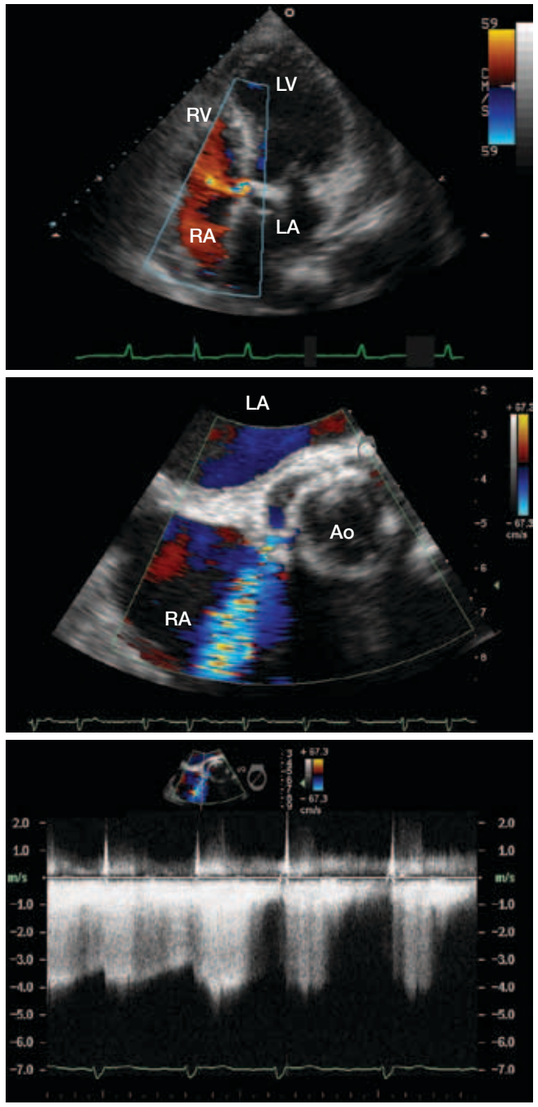

Figure 13.9 A fistulous communication between the aorta and the right atrium (RA) is suspected from the apical 4-chamber image where abnormal flow from the aorta to the RA is seen (*top*). On the corresponding transoesophageal echocardiogram, an echolucent cavity was noted around the aortic root (Ao) with fistulous flow between this cavity and the RA noted on colour flow imaging (*middle*). Via continuous-wave Doppler, high velocity, continuous flow was also observed confirming a shunt from the higher pressure aorta to the lower pressure RA (*bottom*). LA = left atrium; LV = left ventricle; RV = right ventricle.

TTE versus TOE

It is well recognised that the sensitivity for detecting vegetations and complications associated with IE is significantly greater via transoesophageal echocardiography (TOE) compared with TTE. This is because TOE images the heart via the oesophagus. As a result, TOE avoids interfaces such as the lungs, the chest wall and the bony structures of the rib cage and sternum; this allows superior imaging of the cardiac valves. Furthermore, due to the close relationship between the oesophagus and the heart, higher frequency transducers can be utilised which enhances spatial and temporal resolution and, therefore, allows the detection of very small lesions. In addition, the LA surface of prosthetic mitral valves, which is virtually always obscured via TTE, can be readily inspected by TOE so the detection of prosthetic mitral IE is greater. However, despite the obvious superiority of TOE over TTE, TTE is still considered the first choice imaging test in patients with suspected IE. This is because TTE is a non-invasive examination that may establish the diagnosis of IE without the need for TOE; moreover, TTE has the ability to provide additional useful information regarding ventricular function and valvular haemodynamics.

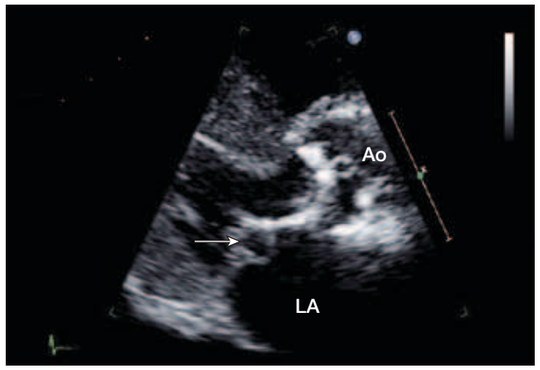

Figure 13.10 This image was recorded from a zoomed parasternal long axis view. Observe the saccular or pouch-like bulging of tissue on the anterior mitral leaflet (*arrow*); this appearance is consistent with a valve aneurysm secondary to infective endocarditis. Rupture of this aneurysm can lead to perforation of the leaflet.
Ao = aorta; LA = left atrium.

Figure 13.11 This gross pathological specimen shows perforation of a myxomatous mitral valve (clinically mitral valve prolapse) secondary to infective endocarditis.

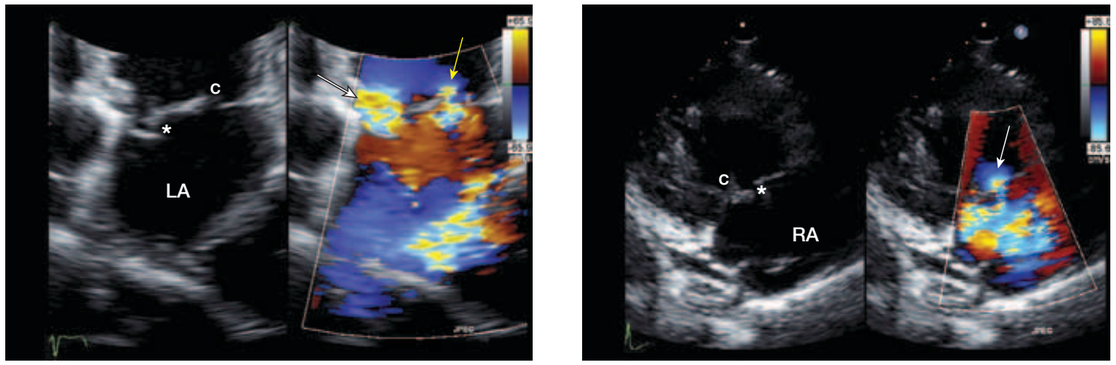

Figure 13.12 Two examples of leaflet perforation from two different patients are shown. The image on the left was recorded from a zoomed apical 4-chamber view. On the 2D image, a tissue defect is noted in the anterior mitral leaflet (*); on the corresponding colour Doppler image regurgitant flow through this defect is observed (*white arrow*). Observe that valvular regurgitation is also present at the site of leaflet coaptation (c) (*yellow arrow*). The image on the right was recorded from a parasternal long axis view of right ventricular inflow. On the 2D image, a tissue defect is noted in the anterior tricuspid leaflet (*) adjacent to the site of leaflet coaptation (c). On the corresponding colour Doppler image regurgitant flow through this defect is observed (*white arrow*). These appearances are consistent with leaflet perforation.
LA = left atrium; RA = right atrium.

Figure 13.13 illustrates an algorithm showing the role of echocardiography in the diagnosis and assessment of IE. Based on this algorithm, when IE is clinically suspected, TTE is performed first. Additional imaging using TOE is indicated: (1) in the setting of prosthetic valves or intracardiac devices; (2) when TTE image quality is suboptimal; and (3) when the TTE study is negative and the clinical suspicion for IE is high. TOE is not immediately warranted in cases where the TTE is negative, where image quality is excellent, when prosthetic devices are absent, and when there is a low pre-test probability for IE. However, in cases where TOE is performed and the initial examination is negative but the clinical level of suspicion for IE remains high, repeat TOE should be performed within 7–10 days. This is especially important in the setting of prosthetic valves where small vegetations or early peri-annular infection may be missed on the initial study. Importantly, in certain clinical situations where the clinical level of suspicion for IE is high and urgent diagnosis is required (for example, patients in septic and/or cardiogenic shock), an initial echocardiographic assessment via TOE rather than via TTE is considered appropriate [13.3].

Assess Functional Abnormalities of Affected Valve(s) and Assess Secondary Consequences of Valvular Disease

As previously stated, underlying congenital or acquired valve disease is one of the precursors of endothelial damage and subsequent IE. Therefore, echocardiography also has a role in the identification of pre-existing or underlying structural heart disease. In addition, as IE can result in valvular obstruction and/or regurgitation, echocardiography has an important role in assessing the degree of obstruction and/or regurgitation and in the evaluation of the secondary consequences of these lesions. Assessment of the degree and severity of valvular obstruction and/or regurgitation as well as the evaluation of chamber dimensions, ventricular systolic function and the estimation of the pulmonary pressures are performed in the standard manner (see Chapters 7-10). In particular, evidence of acute, severe regurgitation may be apparent when there is rapid and aggressive destruction of the valve.

Identify Complications of IE

Three of the most common and severe complications of IE include: (1) heart failure, (2) perivalvular extension of the infection, and (3) embolic events. Heart failure in IE occurs due to significant valve dysfunction caused by leaflet destruction, leaflet perforation, and/or cordal rupture with flail leaflets which leads to significant valvular regurgitation.
Perivalvular extension of the infection refers to the formation of abscess cavities, pseudoaneurysms and fistulas as described above. In addition, if the abscess extends into the conduction tissue located in the interventricular septum (IVS), conduction abnormalities such as first-, second-, and third-degree heart block may result.
An embolic event associated with IE is another important complication of IE. The risk of embolism is highest during the first 2 weeks of antibiotic therapy and is greater for mitral valve IE than aortic valve IE. Several echocardiographic and clinical parameters have been associated with increased risk of embolism. Clinical parameters identifying patients at risk of embolism include: (1) infection with specific microorganisms such as Staphylococci, Streptococcus bovis, and Candida species, (2) previous embolic events, and (3) biological markers. Echocardiographic parameters associated with an increased risk of embolism relate to the size, location, and mobility of the vegetation [13.4-13.5]. In particular, large mobile vegetations (>10 mm), vegetations located on the mitral valve, increasing size of the vegetation while antibiotic therapy is given and multivalvular infection identify patients at high-risk for embolic events.

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