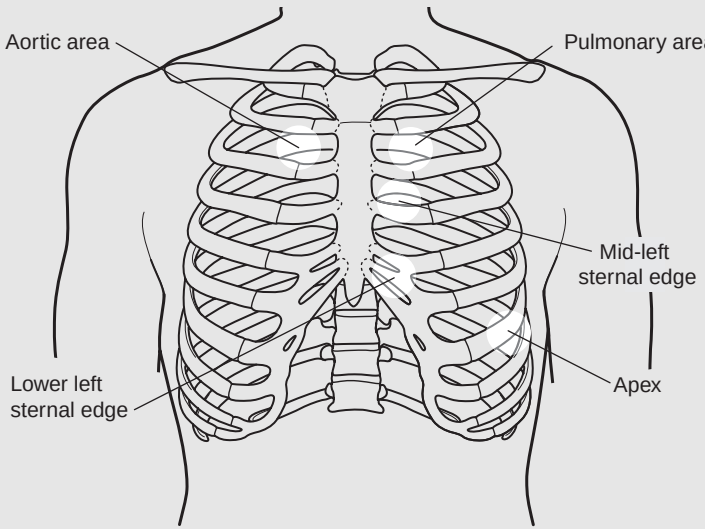
Chapter 1

Introduction



This book focuses on auscultation skills in the assessment of the cardiovascular system; however, as in all areas of clinical medicine, the history and remainder of the clinical examination are equally important, and it is vital to be systematic and consistent in your approach to diagnosis. The clinician must have a routine that ensures that no part of the history or clinical examination is missed. It is also important to remember that a patient can have severe cardiovascular disease in the absence of any abnormal physical signs and grossly abnormal physical signs may be detected in an asymptomatic patient.

Stethoscope

A high quality stethoscope is an important investment and most can last a lifetime. The authors feel that an adult cardiological stethoscope is suitable for *all* ages and that these have better acoustic features than the smaller paediatric and neonatal stethoscopes. The bell is designed to pick up lower frequency sounds, such as the diastolic murmur of mitral stenosis, and the diaphragm for most other sounds. The longer the tube, the more likely it is for the sound to be dissipated: the standard length is recommended (approximately 50 cm). Remember that the best stethoscope cannot compete with background noise or an uncooperative patient!

Fig. 1.1 *Stethoscope*

History

Although there are a large number of cardiovascular diseases, there are only a handful of possible symptoms. Exertional chest pain is most frequently associated with coronary artery disease, but hypertrophic cardiomyopathy and severe outflow tract obstruction may result in cardiac pain. Cardiac disease also frequently produces breathlessness, initially on exertion but in severe disease ultimately at rest. A history of orthopnoea or paroxysmal nocturnal dyspnoea are highly suggestive of cardiac as opposed to respiratory disease. Palpitations are a frequent symptom in the population and usually only represent an awareness of normal sinus tachycardia; however, palpitations related to arrhythmias may be the presenting feature of many different cardiac conditions. Syncope is most commonly vasovagal in origin but this is a diagnosis of exclusion, as syncope may reflect life-threatening cardiac disease. Swelling of the ankles due to dependent oedema is not frequently associated with cardiac disease but is a feature of congestive cardiac failure.

No history is complete without an assessment of cardiovascular risk: this includes family history, smoking, hypertension, diabetes and lipid status.

General physical examination

General examination will include assessment of the height and weight of the patient. Obesity is an important risk factor and cause of added stress in patients with cardiovascular disease. Tall thin stature may be part of the Marfan syndrome. Xanthelasmas are an important sign of raised serum cholesterol. The presence of distal and central cyanosis should be sought, along with finger clubbing. The presence of oedema, initially of the legs but in severe heart failure eventually generalised, including ascites and pleural effusions, should be specifically sought.

Structural heart disease is more common in patients with other congenital abnormalities than it is in the general population; it is therefore important to look carefully for any dysmorphic features in the face, or abnormalities in other systems, particularly in the skeletal or gastrointestinal system.

As with all physical examination, it is important to have the patient fully undressed. When examining children, however, it is sometimes the case that trying to get them undressed may upset them so much that it is impossible to listen to them and compromise is therefore necessary.

Cardiovascular examination

Arterial pulsation/blood pressure

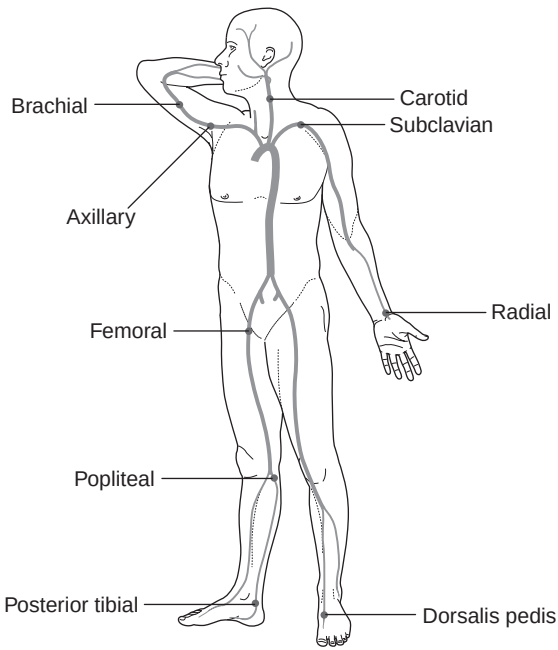


Fig. 1.2 *Arterial pulses*

The radial pulse is initially assessed for rate and rhythm. The character and volume are classically assessed at the carotid pulse, but, particularly in children, this may be distressing and the brachial pulse may be used. All the pulses should be palpated and the volume compared with the other side (not simultaneously in the case of the carotid pulse). The difference between the systolic and diastolic blood pressure measured with a sphygmomanometer gives an important objective measure of pulse pressure.

Venous pulsation

The central venous pulse is assessed with the patient lying comfortably at 45° and the height is described as centimetres above the clavicle. In normal patients the jugular venous pulse is not visible. It may be very difficult to assess, particularly in obese patients. A raised jugular venous pressure is an important sign of cardiac failure, or obstruction to the superior vena cava, in which case pulsation is lost.

Inspection of chest

The chest should be inspected for signs of deformity, visible pulsation, enlarged veins and scars from previous surgery. In thin individuals the apex beat may be visible.

Palpation of chest

The chest is palpated to determine the position of the cardiac apex, which is the lowest and outermost point where the cardiac pulsation is felt. The patient must be lying or sitting straight. In healthy individuals it will be in the mid-clavicular line, in the 5th intercostal space on the left. The position of the apex may be affected by the heart being displaced in the chest due to spine and rib deformities or lung disease, as well as cardiac disease. If the apex is difficult to define, do not forget to palpate on the right side of the chest for dextrocardia. The quality of the apex beat should be assessed but this is affected by subcutaneous fat. The apex should also be felt to check for thrills. The chest should then be palpated using the flat of the hand on the left and right of the sternum to feel for a right ventricular heave (*left of sternum*) and thrills on either side. The suprasternal notch is palpated to check for an aortic thrill.

Percussion of chest

The cardiac dullness may be percussed but in practice this is not routinely done. Percussion of the chest is more useful to confirm liver size, and whether significant pleural effusions are present.

Auscultation

Remember
- Heart sounds.
- added sounds.
- murmurs.

Heart sounds

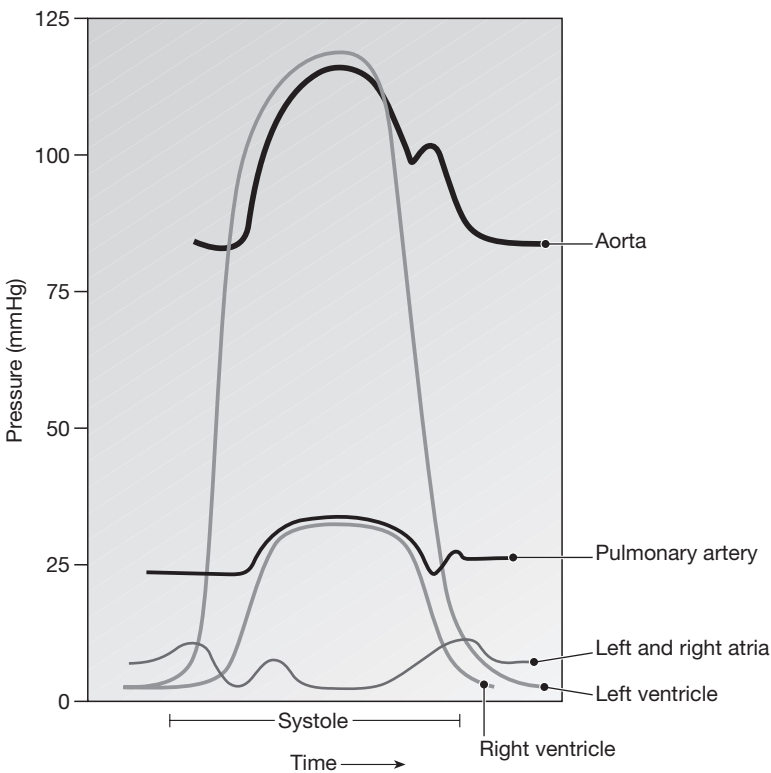


Fig. 1.3 *The cardiac cycle*

First heart sound S_1
The first heart sound is composed of the mitral and tricuspid valves closing at the beginning of systole. The mitral valve closes before the tricuspid valve, although it is not usually possible to appreciate the dual nature of the sound.

Second heart sound S_2
The second sound is caused by the closure of the aortic and then pulmonary valves. Because the delay is greater than in the first heart sound this usually can be heard. The splitting becomes wider with inspiration and narrower with expiration.

Added sounds
S_3 and S_4
The third and fourth heart sounds are low frequency sounds which occur in diastole. The third heart sounds occurs in early diastole at the time of maximum ventricular filling. It may be heard in young fit adults and during pregnancy. The fourth heart sound occurs at the time of atrial contraction and is therefore only present if the patient is in sinus rhythm. Both these sounds are best heard with the bell of the stethoscope and with the patient turned slightly onto the left side.

Clicks and snaps
The opening of a normal heart valve is silent. Ejection clicks arise from an abnormal aortic or pulmonary valve as it opens, and occur early in systole. They may be mistaken for splitting of the first heart sound. An opening snap arises from an abnormal mitral or tricuspid valve and therefore is heard in diastole. Note that as the valve becomes more severely affected and the movement is decreased the click or snap will disappear.

Knock and rub
In constrictive pericarditis there may be a loud, low frequency diastolic noise known as a knock. A pericardial rub is a high frequency noise, loudest in systole, but often present in diastole as well. A rub may vary from hour to hour, and if a significant effusion develops the rub will disappear.

Murmurs
As with the whole cardiovascular examination it is important to have a systematic approach to describing a murmur. The timing of a murmur (systolic or diastolic) may be difficult, particularly if the patient is tachycardic. Systole

may be timed by feeling the carotid pulse in the neck. Murmurs are systolic, diastolic, systolic and diastolic or continuous. The timing of murmurs is discussed in the relevant chapters.

Murmurs may be low pitched, such as mitral stenosis, or high pitched, such as small ventricular septal defects (VSDs). Murmurs vary in intensity but it is important to note that loud murmurs do not necessarily indicate severe disease. For example, small VSDs may give loud murmurs, whereas large ones may produce no murmur. Systolic murmurs are traditionally graded out of 6, with a 1/6 murmur being quiet and a 6/6 being very loud. Diastolic murmurs are graded out of 4.

Table 1.1

Grade	Thrill	Murmur
1/6	Absent	Very quiet
2/6	Absent	Quiet
3/6	Absent	Easily audible
4/6	Present	Loud
5/6	Present	Audible with stethoscope half off chest
6/6	Present	Audible without stethoscope

It is also important to determine whether the murmur changes during respiration. Typically, murmurs arising from the right heart are accentuated on inspiration.

We have arranged this book by the position where the murmur is loudest. This is because we feel that we rely particularly on this feature to identify a murmur. It is also important to determine where else a murmur is heard, or the *radiation*, as this also gives important information on the source of the murmur.

Investigations

Electrocardiogram and chest radiograph

The electrocardiogram (ECG) and chest X-ray (CXR) give important information that may help to confirm a diagnosis or help to assess severity. We have therefore included a short note on possible ECG and CXR features, although detailed descriptions of the abnormalities are beyond the scope of this book.

Echocardiogram, cardiac catheterization and magnetic resonance imaging

Full assessment of cardiac pathology increasingly includes the use of echocardiography, and this service is being offered in many district general hospitals, although cardiac catheterization and cardiac magnetic resonance imaging remain the province of specialist centres. It is, however, vital to understand that an accurate echocardiographic assessment depends upon accurate assessment of the clinical findings.

Learning point
- You only find what you look for.

1.1 Normal heart sounds

Remember that the recognition of abnormal hearts sounds depends on the ability to appreciate, with certainty, the normal.

Start

Listen to the recording. Focus on S_1 while watching the systolic diastolic cursor (SDC) and note that S_1 coincides with the SDC landing on systole. When confident of timing of S_1, focus on S_2: note that S_2 coincides with the SDC landing on diastole.

Stop

Minimize S_1

Start

Note normal phonocardiogram without an S_1.

Reset

Minimize S_2

Note normal phonocardiogram without an S_2.

Reset

Start

Listen again to the native recording. Stop the recording and listen after increasing S_1 and S_2 to maximum if you wish.

1.2 Third heart sound

Start

Listen to the recording. Focus on S_1 while watching the SDC and note that S_1 coincides with the SDC landing on systole. When confident of the timing of S_1 focus on S_2. Note that S_2 coincides with the SDC landing on diastole. Note the third heart sound in diastole.

Stop

Minimize Diastole

Start

The third heart sound has now been eliminated.

Stop

Reset

Listen again to the native recording. It is easy to hear why this has been likened to a galloping horse.

Stop

Repeat until you are confident that you can identify the third heart sound in diastole.