GENERAL EXAMINATION

A general assessment of the cardiovascular system (Table 1) should take into account the patient's age and sex. It is also essential to determine if the patient:

- is in pain
- is experiencing shortness of breath
- has a cough
- is pale or cyanosed
- has evidence of fluid retention
- has the ‘mitral’ facial appearance (dilated cyanotic vessels over the cheek bones)
- has chest operation scars
- has tar-stained fingers
- has signs of hyperlipidaemia (including fat deposits in the skin).

The first part of the patient that a doctor usually comes into contact with is the hands, and their temperature and colour should be noted. Peripheral cyanosis in the absence of central cyanosis might suggest inadequacy of peripheral circulation, as would coldness of the peripheries. Clubbing, in the presence of heart disease, suggests either cyanotic congenital heart disease or infective endocarditis. Splinter haemorrhages suggest infective endocarditis.

Table 1 Review of cardiovascular examination

<table>
<thead>
<tr>
<th>Action</th>
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<tbody>
<tr>
<td>Assess the whole circumstances surrounding the patient's presentation</td>
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<tr>
<td>Assess the patient's general condition looking specially for signs of hyperlipidaemia such as xanthelasma</td>
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<tr>
<td>Assess the patient's hands</td>
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<tr>
<td>Assess the characteristics of the radial pulses and symmetry of radial pulse</td>
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<tr>
<td>Assess other pulses if appropriate</td>
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<tr>
<td>Take the blood pressure</td>
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<tr>
<td>Assess the jugular venous pressure</td>
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<tr>
<td>Inspect the chest wall</td>
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<tr>
<td>Palpate the precordium</td>
</tr>
<tr>
<td>Auscultate, assessing the heart sounds, added sounds, and murmurs</td>
</tr>
<tr>
<td>Look for signs of right or left-sided heart failure</td>
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</tbody>
</table>

THE PULSE

The pulse impulse as felt in the arteries is the pressure wave initiated by ventricular systole and usually, but not always, reflects blood flow and cardiac output. Traditionally, the pulse is assessed by gently compressing the radial artery against the lower end of the radius, using the pulps of the index and middle fingers. Palpation of the carotid pulse may give much more information about the pulse character.

When palpating the pulse, pay particular attention to five major characteristics: rate, rhythm, volume, character and state of the vessel wall.

At some stage of the examination, the rest of the peripheral pulses (Fig. 1) should be felt. When the radial pulse is being palpated it is useful to compare the two sides.

RATE

A fast pulse, about 100–150 beats per minute, may occur in exercise, heart failure, fever, thyrotoxicosis, severe anaemia, acute haemorrhage or ectopic pacemaker(s) either in the atria or ventricles.

Ectopic pacemakers occur in such conditions as atrial flutter, paroxysmal supraventricular tachycardia, ventricular tachycardia and multiple individual ectopic beats (either atrial or ventricular). A slow pulse, about 50 beats per minute or less, may be caused by extreme fitness, hypothyroidism, complete heart block, digitalis overdosage, β-blocker therapy.

RHYTHM

The pulse rhythm may be regular or irregular. If the pulse is irregular, the apex beat rate should be ascertained and compared with the pulse rate at the wrist. A slower pulse at the wrist than at the apex of the heart constitutes a pulse deficit. This means that not all ventricular contractions are forceful enough to produce a detectable peripheral impulse. It is important to detect a pulse deficit as a normal peripheral pulse rate may conceal an inefficient fast heart rate. A pulse deficit may be found in atrial fibrillation, ‘extra’ heart beats (extrasystoles) and in heart block. In atrial fibrillation the pulse rate is irregular and, unlike the pulse in atrial or ventricular ectopics (in which there are predictable compensatory pauses after each ectopic beat), the timing and force of the following pulse is unpredictable.

VOLUME

The term ‘pulse volume’ refers to movement of the palpatlng finger and not necessarily to the volume of blood flowing.

A small volume pulse is found in blood flow obstruction, the causes of which include:

- narrowing of the heart valves (stenosis)
- a low blood volume (as in gastrointestinal haemorrhage or dehydration)
- post-heart-attack (myocardial infarction) state
- any state in which the heart cannot contract efficiently
- generalized or localized peripheral circulatory inadequacy for any reason
- in shock states (p. 138).

VESSEL WALL

Clinical assessment of arterial wall hardening (previously thought to reflect arteriosclerosis) is liable to error.
**Pulse Character**

Deep inspiration normally increases the pulse rate. Inspiration increases the chest volume, thus the lungs can contain more blood than otherwise. This leads to a reduced return of blood to the left side of the heart, which then speeds up to compensate for the reduced blood volume presented to it. If marked, this will constitute sinus arrhythmia (Fig. 2), which is a cyclical variation in the pulse rate, speeding up during inspiration and slowing down during expiration. It is a common finding in young people.

The ability to appreciate a normal pulse character can only be gained from experience.

**Collapsing Pulse**

A collapsing pulse is caused by a large difference between the systolic and diastolic blood pressure. A collapsing pulse is thus best ascertained by taking the blood pressure and finding a wide pulse pressure. However, it is traditionally appreciated by raising the arm while monitoring the pulse, and feeling a forceful jerk of brief duration with several fingers. Sometimes this wide pulse pressure imparts a distinctive jerking movement of the neck structures because of the marked carotid artery pulsation. In addition, the arterial capillaries may exhibit visible pulsation. This is best seen if the nails are gently compressed against the nailbed when the arm is elevated. The causes of a collapsing pulse include:

- aortic incompetence
- high output cardiac states such as found in thyrotoxicosis
- severe anaemia
- arteriovenous communications
- high fevers
- complete heart block.

**Pulsus Paradoxus**

Pulsus paradoxus is a diminution in pulse volume during inspiration which may occur with pericardial effusions, constrictive pericarditis or in serious bronchoconstriction. The blood pressure also falls during inspiration.

**Plateau Pulse**

A plateau pulse is a sustained but small volume pulse which is found in aortic stenosis.

**Pulsus Alternans**

Pulsus alternans is an alternation of normal and small volume pulses, representing failure of the left ventricle to provide the normal impulse with each contraction. When the blood pressure is taken, the pulse rate suddenly doubles as the sphygmomanometer mercury falls (see p.25). There are in effect two different systolic blood pressures.

**Pulsus Bisferiens**

Pulsus bisferiens is a double impulse which is found in combined aortic stenosis and incompetence.

**Examination of the Carotid Arteries**

In patients with cerebrovascular symptoms it is important to evaluate the carotid arteries, as neurosurgical intervention may be possible. A murmur or a thrill not transmitted from the heart (or absent pulsation) may be indicative of impaired or absent blood flow. Only palpate the carotid arteries one at a time, and if there is no pulsation in the first ensure you do not occlude the second on palpation.

**Peripheral Perfusion**

If there is poor peripheral perfusion, the hands and feet may be cyanosed (because of increased extraction of oxygen from the blood associated with the slower circulation). The temperature of extremities may be diminished as the slowly circulating blood cannot supply heat to the peripheries fast enough. Normally, blanching of the skin caused by digital pressure only lasts for a few seconds, but in the presence of peripheral circulatory failure the blanching time is prolonged. The blood pressure may be low (if it can be measured) in arteries which supply the area involved.

**Acute Limb Ischaemia**

In acute limb ischaemia there may be a history suggesting a source for an occluding embolism, a predisposing hyperviscosity state of the blood or severe peripheral vascular disease. The limb affected is typically painful, pale on elevation, with dusky pink or redness on subsequent dependency, cold and pulseless.

Later ulceration and gangrene may develop (Fig. 3).

**Chronic Limb Ischaemia**

In chronic limb ischaemia, the history ranges from muscle pain on exercise, relieved by rest (claudication), in the calf, thigh, or buttock to persistent pain or non-healing ulcers and gangrene. Relevant pulses will be diminished or absent.

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![Fig. 2 The pulse character.](image-url)