

25. Cardiovascular and Respiratory Assessment

All patients coming into hospital for operation, either as a day-case or with an overnight stay, should have an assessment made of their cardiovascular and respiratory systems. Traditionally, the patient was “clerked” by a house officer on the ward. This involved a full history, examination and investigations such as blood tests, a chest radiograph and ECG. This has been superseded by dedicated nurse-led pre-operative assessment clinics.

Every patient receiving anaesthetic will be seen pre-operatively by an anaesthetist, who will go through their medical history and examine them as necessary. However it is useful for OMFS trainees to appreciate systemic disease and how it may affect surgery and anaesthesia.

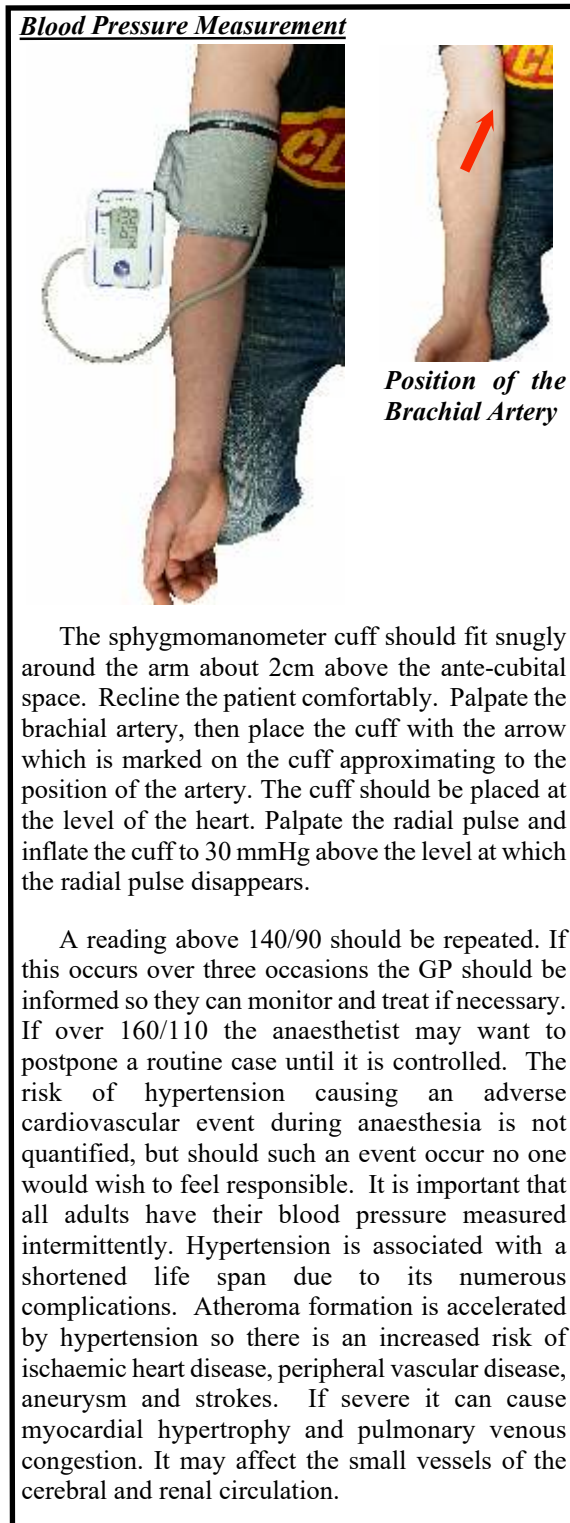
It should also be noted that as an OMFS trainee you will be assisting in the management of post-operative patients on the ward. The post-operative period is critical; occasionally these patients develop medical complications rather than complications from the actual surgery itself. In order to hand over to your senior colleagues, it will be helpful if you are able to understand what might be happening and form a rough differential diagnosis.

The medical history is the most important part of eliciting disease; physical examination will usually only confirm what has already been suspected during history taking. A full medical clerking includes a history and examination of the cardiovascular, respiratory, gastrointestinal, renal, urinary, neurological and locomotor systems; we will not address which will be attended to by the nurse and anaesthetist. However cardiovascular and respiratory health will be significant in most OMFS patients.

Possibly the most important part of the assessment will be the recording of blood pressure. Hypertension is a risk factor for cardiovascular disease, especially heart failure, ischaemic heart disease, strokes and peripheral vascular disease as well as chronic kidney disease.

Update of important cardiovascular and respiratory pathology

A basic knowledge of common and serious cardiovascular and respiratory pathology will aid in putting clinical assessment and post-operative complications into context.



Symptom or Sign	Significance
Chest Pain	Angina:-cardiac muscle ischemia. Unusual as managed well medically or surgically esp. angioplasty but may give a history
Shortness of breath (SOB)	Heart failure (left side) Unusual at rest as will be treated but may give a history. Ask about SOB on exertion
Orthopnoea	SOB on lying flat caused by heart failure. Ask if they need many pillows to sleep comfortably
Ankle swelling	Heart failure (right side). Will probably have been managed medically but may give a history
Faints or ‘funny turns’	May be caused by arrhythmias. Should have an ECG to investigate
Palpations	May indicate arrhythmias, most commonly atrial fibrillation should have an ECG as it can easily lead to strokes
Claudication	Pain in calves on walking caused by peripheral vascular disease. May indicate widespread cardiovascular disease - myocardial ischemia risk of strokes and renal disease

Cardiovascular System Signs & Symptoms

Heart failure is when the heart is having difficulty pumping blood (and therefore oxygen and nutrients) to the peripheral tissues. There are numerous possible causes of failure. Most commonly it will result from

myocardial ischaemia, hypertension, arrhythmias (often secondary to ischemia), valve disease, metabolic diseases such as diabetes or thyroid disease or any disease process which damages the cardiac muscle (myopathy). Sometimes failure may result from lung disease; chronic obstructive pulmonary disease (COPD) can result in pulmonary hypertension causing heart failure (“cor pulmonale”).

The most common cause is ischaemic heart disease (IHD) where, through a lack of oxygen, the muscle of the myocardium has suffered irreversible damage and is no longer able to pump adequately. Most patients will give a history of angina, report a previous myocardial infarction or will have undergone angioplasty. Signs of IHD can also be found in some ECGs, which are beyond the scope of this book.

In some cases the heart may fail as a result of a rhythm disorder (arrhythmias) secondary to IHD or old age; this is diagnosed by ECG. Atrial fibrillation (AF) is the most common rhythm abnormality causing heart failure. AF is diagnosed by feeling the peripheral pulse as “irregularly irregular”. It is potentially dangerous as it leads to strokes and should be managed with anti-arrhythmics and anti-coagulants.

Valvular heart disease can cause heart failure, when a valve is either incompetent (incomplete closure of a valve causes retrograde flow) or stenosed (a stiff or thickened valve resists smooth anterograde flow). These may be suspected when an added heart sound or “murmur” may be heard on auscultation of the heart and confirmed by an ECHO cardiogram, a type of ultrasound examination.

In mild heart failure the patient may have no symptoms at rest but on exertion the diseased heart may not be able to pump efficiently enough to provide adequate tissue oxygenation. This may result in shortness of breath on exertion.

The signs of failure can be understood by considering the two sides of the pumping heart.. The right side receives deoxygenated blood from the peripheral tissues and pumps this to the lungs. The left side receives oxygenated blood from the lungs and pumps this to the peripheral tissues. Blood restricted from efficient entry through a failing right side of the heart will lead to increased central venous pressure and fluid accumulation in the peripheries; this is seen clinically as a raised jugular venous pressure (JVP) and ankle, leg or sacral pitting oedema. Blood damming behind a failing left side of heart

accumulates in the lungs causing pulmonary oedema, (producing shortness of breath) and in severe cases pleural effusions. This is detected clinically as basal crepitation on auscultation and dullness to percussion at the lung bases.

The most common respiratory disease you are likely to encounter is an upper respiratory tract infection (URTI). This is a relative contraindication to having general anaesthetic as patients are more likely to have laryngo-bronchospasm with an endotracheal tube and there is increased risk of pneumonia. Although it is sensible to delay surgery until at least two weeks after recovery, complications can, to a certain extent, be anticipated. Thus it is prudent to continue with urgent surgery and delay only non-urgent cases.

Asthma is the most common co-existing chronic respiratory disease you are most likely to come across pre-operatively in young patients. Usually this is mild and patients will have the symptoms of wheezing or coughing only when they have a cold, and are controlled with a salbutamol +/- corticosteroid inhaler. These patients are quite easily managed by the anaesthetist.

Patients with more severe asthma may give a history of requiring previous hospital admissions or home nebuliser therapy. A nebuliser is a much more efficient and effective mechanism of delivering inhaled medication than inhalers. These patients may need a short course of steroids to prevent an acute attack and monitoring with a peak expiratory flow meter. Clinical signs on examination may include dyspnoea and wheeze during an attack, but otherwise would be expected to be normal.

Chronic obstructive pulmonary disease (COPD), unlike asthma, is largely irreversible airways constriction. It is commoner in older patients and is commonly associated with smoking. COPD patients exist on a spectrum where mild sufferers only develop shortness of breath on exertion, whereas in severe cases patients require long-term oxygen therapy and nebulisers at home. Like asthmatics, they are likely to be on regular inhalers. Severe COPD patients will likely not be candidates for surgery under general anaesthetic unless for trauma or cancer. If you suspect that a patient is having an acute attack of asthma or COPD, seek help from medical colleagues as these patients may require oxygen, nebulisers and corticosteroids.

Some of the abnormal physical signs seen in respiratory disease are common to some of those found in cardiovascular disease.

Symptom or Sign	Significance
Cough	Any cause of infection, inflammation or tumour. May be only symptom in asthma
Blood in sputum	May be caused by carcinoma but there are many other causes, should be thoroughly investigated
Shortness of Breath	Can be caused by most lung diseases particularly COPD and asthma as well as heart failure and anaemia
Wheeze	Commonly COPD & asthma but any cause of bronchial obstruction including tumour
Abnormal respiratory rate	Normally 12 - 16 per min. increased in any disease affecting respiratory exchange. Breathing out slowly through pursed lips occurs subconsciously to keep the airways open to the end of the respiratory cycle to aid gas exchange.

Respiratory System Signs & Symptoms



For examination both the bell and the diaphragm of the stethoscope should be used. The bell, pressed lightly on the chest wall, is best for hearing low pitched sounds, whereas the diaphragm is best used for high frequency sounds and is therefore used more frequently.

Examination



1. **Hands:** examine for nicotine staining, warmth and clubbing of the finger ends



2. **Pulse:** two fingers are used to palpate the radial artery. Is the pulse 'full' or weak, regular or irregular? Count the pulse rate



3. **Trachea:** Palpate: is it deviated to either side? Is there any deformity of the chest wall, do both sides expand equally during inspiration?



4. **Jugular Venous Pressure (JVP):** Recline the patient at 45° and ask them to look at a fixed point on their left. The JVP is normally 5 cms above the left atrium which is about 5cms below the manubrial sternal angle (arrow A). Put a finger across the external jugular

at the base of the neck and press gently. A column of blood will become visible in the vein (arrow B), which will flow away when the finger is removed. In heart failure the column may be there without the external pressure. The JVP will be the height of any column of blood visible in the Internal Jugular Vein + 5 cms above the manubrial sternal angle (arrow A).



5. **Auscultate** the chest with the diaphragm of the stethoscope and percuss the upper lobes at the front and upper and lower lobes at the back. Examine beneath the axilla on the left for the middle lobe of the lung, there is no middle lobe on the right.



6. **Palpate** for the apex beat of the heart: it should normally be at the 5th intercostal space in the mid clavicular line. Also note whether there is a 'thrill' which is a palpable murmur and best felt with a flat palm held horizontally across the 2nd and 5th intercostal spaces in the mid clavicular line



7. **Murmurs:** For mitral murmurs (Area M) listen at the 5th intercostal space (just beneath the left

nipple) in the mid clavicle line. This is the mitral area (M) which extends from the apex to the mid axillary line. Mitral murmurs are often low pitched and 'rumbling'; best heard with the bell of the stethoscope. First listen with the patient sitting up, and holding his breath in full expiration. However, a quiet mitral murmur will best be heard with the patient lying on their left side in full expiration which brings the heart over towards the chest wall. While listening collate the findings with the cardiac cycle by palpating the carotid artery pulse. Aortic murmurs (Area A) tend to be more high pitched and are heard with the diaphragm of the stethoscope from the right of the sternum at the level of the first rib, passing over to the right of the sternum and down to the second intercostal space.



8. **Abdomen:** palpate with the patient lying flat with arms laid by his side. Palpate with the flat of the hand from the right iliac fossa to the right costal margin.



9. **Feet:** feel for the dorsalis pedis pulse which will be weak or absent in peripheral vascular disease. Examine for oedema consequent upon right sided heart failure. This will show 'pitting' if you push your thumb into it.

Notes on examination

1. Nicotine staining indicates smoking a risk factor for cardiovascular and respiratory disease. Severe pulmonary disease produces CO₂ retention causing dilated peripheral veins and warm extremities. Very severe disease may produce peripheral cyanosis. 'Clubbing' of the finger over the distal phalanx may be congenital as in cyanotic heart disease or acquired as in endocarditis, chronic hypoxia, bronchogenic carcinoma, mesothelioma, interstitial lung disease, as well as certain gastrointestinal disease such as inflammatory bowel disease and liver disease. However many cases are not associated with any underlying pathology.

2. The commonest irregularities are extra systoles which may occur regularly, or atrial fibrillation which always gives an irregular irregularity. These are indications for an ECG for more accurate diagnosis. Normal pulse rate is between 60 and 100 beats per minute with an average of 72 beats at rest. Even mild exercise or emotion will raise it. It will be higher in children, perhaps between 90 and 110, and lower in the elderly, 55 to 60. Well trained athletes may have a low resting rate.

3. A trachea deviated from the midline is abnormal. The trachea may be deviated away from the side of a tension pneumothorax or large plural effusion or towards a lung which is collapsed, severely fibrosed or infiltrated with tumour. Movement of the chest wall may be reduced in certain pulmonary conditions e.g. consolidation. Certain chest deformities such as a barrel shaped chest suggest hyperinflation as may occur in COPD. Reduced lung expansion unilaterally may be due to lung collapse, pleural effusion or pneumothorax or bilateral in lung fibrosis.

4. The JVP is a rough approximation of the Central Venous Pressure (CVP) which will be increased in heart failure and decreased in hypovolaemia (significant blood loss). In a patient acutely ill with severe haemodynamic upset (or potentially so, such as in major surgery) this may be measured with a central CVP line and manometer. A specific measurement, as described, is probably too ambitious. It will usually be enough to say that the JVP is raised if the column of blood is anything other than not visible or just visible at the base of the neck.

5. For examination of the lung bases the patient is asked to lean forward and cough. The base of the lung fields are auscultated for crepitations which sound like rustling tissue paper. Percussion of the basal lung

fields may produce a dull note if there is a pleural effusion due to severe heart failure. A dull note will be heard in inflammation such as pneumonia. A hyper-resonant note may also be heard in pneumothorax or chronically where the lungs are hyper-inflated in COPD or asthma. Normal breath sounds are described as vesicular. A wheeze may be heard in asthma, and crackles may be heard in upper respiratory tract infection. Bronchial breathing is a harsh sound of air passing through the trachea and large airways. It may be heard over the peripheral lung fields if they are consolidated such as in pneumonia; this is because the sound will be conducted more efficiently.

6. Normally palpate with the flat of your hand to find the apex and then when located palpate more precisely with two fingers, as shown. The position of the apex beat may be displaced down and laterally if the left ventricle is hypertrophied as may occur in valve disease or severe hypertension

7. All diastolic murmurs are abnormal but a systolic murmur may be an innocent 'flow' murmur if heard in very fit young adults or children; otherwise systolic murmurs are usually due to aortic valve stenosis (common in the elderly) or mitral valve regurgitation. The finding of a murmur usually merits an ECHO cardiogram and a cardiologists opinion.

8. An engorged liver from heart failure will be tender, smoothly enlarged and palpable below the left costal margin. A normal liver should not be palpable. In severe heart failure fluid may enter the peritoneal cavity (ascites). A large aortic aneurysm may be palpated by feeling centrally in the abdomen. It will expand in size with each heartbeat.

9. The dorsalis pedis pulse is felt in the first metatarsal space. Alternative is the posterior tibial artery midway between the medial malleolus (ankle) and the heel. In heart failure fluid will accumulate in and around the systemic circulation. This will lead to an increased central venous pressure and hence JVP (see before), swelling of the feet or ankles and a smoothly enlarged tender liver. If the patient is bed bound the fluid may accumulate in the sacral area rather than the feet. Atheromatous disease in the arteries may produce ischaemic heart disease, cerebrovascular accidents (strokes and transient ischaemic attacks), aneurysms and peripheral vascular disease. The latter may show as weak or absent pulses, cold feet, ulcers or gangrene.