1 The daily management of patients in surgical wards

1.1 Admitting the surgical patient

The first two chapters of this book deal with the daily tasks a junior surgical trainee has to perform. They will also help medical students to understand what is going on in a surgical ward and to prepare themselves for their first few years of work after qualifying as a doctor.

Managing people who need operations

Many people tend to assume that young doctors are trained to regard the human body as a collection of mechanical tubes and pipes and that they overlook the importance of the 'individual'. In fact, most doctors find their work fascinating because they are dealing with a human body enclosing a mind and a spirit as well as complex, delicate biological systems.

The management of patients in surgery is dominated by this difference between the mechanical and the human, the difference between a technician and a surgeon. To obtain good results in surgery the mechanics must, of course, be correct. The anastomosis must not leak, the wound must heal and the electrolytes must be kept in the correct range. Over and above this, however, the patient has to believe in their management and obtain confidence from their carers. Efforts spent on developing a trusting, friendly and honest relationship can pay huge dividends during the patient's illness. Every practising doctor knows this and has experience of patients surviving by their own will or dying because they have just given up. Maintaining a patient's

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morale can be just as important as maintaining their blood pressure. The ability to develop good relationships with patients will transform the knowledgeable bad doctor into the excellent and successful practitioner whom most students aspire to be.

The junior surgical trainee plays an indispensable role in the organization of a surgical firm. While the more senior members of the firm have to split their time between the ward, the outpatient department and theatre, the junior surgical trainee's main priority is the ward. He or she is the link between the patient, relatives, surgical staff, nurses and paramedical staff, and will coordinate all aspects of patient care.

The daily ward work

Routine ward work can be split into five parts:
- admitting the patient
- preparing the patient for operation (see p. 18)
- organizing the operating list (see p. 10)
- the junior surgical trainee in theatre (see p. 28)
- conducting regular postoperative ward rounds (see p. 30).

Admitting the patient

Remember the underlying principle of clinical practice. Management depends on diagnosis, and diagnosis depends on history, examination and investigation.

Make sure that you have seen the outpatient notes and the consultant's letter before you start the routine clerking. A working or definitive diagnosis may have been made, but always make your own assessment critically and independently. Avoid blindly following a predetermined diagnostic pathway. Check that any X-rays, scans and other specific investigations taken previously are available on the ward. By keeping an open mind you will be able to spot problems that may have been missed in a hurried outpatient assessment.

A full clerking is then carried out on all patients. Some points require special attention when an operation is being planned. The junior surgical trainee plays an important role in the medical assessment of the surgical patient. You are looking for any

indication that the patient may not be fit for surgery or may be liable to develop problems postoperatively. Particular points are listed below.

History

CHEST

Look for the following.

- Pre-existing chest disease.
- Shortness of breath on minor exertion or at rest.
- Cough, and is it productive?
- History of asthma. Beware prescribing non-steroidal anti-inflammatory drugs (NSAIDs).
- Smoking habit.

CARDIOVASCULAR SYSTEM

Is there a history of the following.

- Chest pain or angina?
- Symptoms of cardiac failure (such as oedema, nocturnal dyspnoea, orthopnoea or palpitations)?

ALIMENTARY AND GENITOURINARY SYSTEMS

Ask about the following.

- Anorexia and weight loss. Malnutrition increases risks of complications after many types of surgery. Does this require correction to get the patient safely through a particular treatment schedule?
- Bowel habit. Might a planned treatment lead to constipation? Consider the need for laxatives to keep the bowels moving.
- Heartburn and reflux. A patient with reflux may have an increased risk of aspiration during induction of anaesthesia. Consider the need for a proton pump inhibitor (PPI) and warn the anaesthetist.
- Peptic ulcer disease. Beware of prescribing NSAIDs.
- Micturition. Poor stream, nocturia or hesitancy may be a clue to postoperative retention or infection. Bladder distension may be difficult to detect in the presence of a recent lower abdominal incision.
- Periods. Heavy periods are a common cause of anaemia in women.

LOCOMOTOR SYSTEM

- Does the patient suffer from arthritis?
- Are there any particularly stiff joints?
- Intubation may be difficult in the presence of cervical joint disease.
- It may be difficult or impossible to put patients in the lithotomy position on the table when they have fixed deformities or stiff hips, knees or back.
- In the case of rheumatoid arthritis anteroposterior (AP) and lateral C-spine views (in flexion and extension) might be necessary to rule out an atlantoaxial instability.

PAST MEDICAL HISTORY

Find out about the following.

- Previous operations, and whether they were followed by any complications such as deep venous thrombosis or infection.
- Previous anaesthetics. Were there any problems such as drug reaction, excessive vomiting, or malignant hyperpyrexia?
- Previous history of rheumatic fever that may have damaged the heart valves. With such a history you must examine the heart carefully. Prophylactic antibiotics may be needed for a significant valvular lesion.
- Previous history of jaundice.
- Medical conditions. Does the patient suffer from any other diseases that will influence your management? These are dealt with in section 1.3 and include diabetes, heart disease and chest disease.
- Methicillin-resistant *Staphylococcus aureus* (MRSA) status. This may be important for patients who have been in hospital or institutional care for some time before surgery, for those who are immunosuppressed and for patients with existing wounds. Specific measures are discussed below.

DRUG HISTORY

Many drugs interfere with anaesthetic agents. Some may lead to electrolyte abnormalities (e.g. diuretics). Care must be taken with those on anticoagulants. The antiplatelet effect of aspirin lasts up to 7 days and combination of aspirin with other antiplatelet agents can cause excessive bleeding after surgery. Many

hospitals have specific written policies for elective procedures, but patients requiring urgent or emergency surgery are particularly at risk.

There is controversy regarding the oral contraceptive in the perioperative period. We advise offering deep venous thrombosis prophylaxis to all young women on the pill.

ALLERGIES

Ask about allergies to:

- anaesthetics
- antibiotics
- applications (e.g. iodine, elastoplast, latex rubber).

Check whether the allergy is genuine by determining what sort of reaction the patient had when they were exposed to the agent. Many patients say they are allergic to antibiotics because they felt ill or nauseated at the time they took them. Where there is any possibility of allergy the patient's record should be marked and that drug avoided. Latex sensitivity is common and this requires special packaging of equipment and the use of non-latex gloves and tubes in the operating theatre.

Whenever any allergy is noted, this should be clearly marked on the operating list.

FAMILY HISTORY

Is there a family history of reaction to an anaesthetic? If positive, inform the anaesthetist.

SOCIAL HISTORY

Important points are as follows.

- The patient's job. This will determine when the patient can go back to work.
- Support. What sort of support is available from the family or friends postoperatively? This can be important in cases for day surgery.
- Habits. Check how much the patient drinks and smokes. A heavy drinker may be resistant to the normal doses of anaesthetic agents. A heavy smoker will be very liable to develop a chest infection postoperatively and preoperative physiotherapy may be indicated to minimize this risk.

Examination

Always try to improve on the findings made during the outpatient assessment. Finding a supraclavicular lymph node, for instance, may save a patient with gastric cancer from an unnecessary abdominal operation (see pp. 146, 296).

Details in the general examination that may be important are as follows.

GENERAL CONDITION

Look for signs of dehydration, anaemia, jaundice, lymphadenopathy or cachexia. These may require correction before operation is undertaken.

MENTAL STATE

Any patient will be anxious about the operation and in some this anxiety is extreme. Careful explanation and reassurance is required. A mild hypnotic or tranquillizer given on the night before operation is sometimes helpful.

CARDIOVASCULAR SYSTEM

Perform a full examination and inform the anaesthetist of any significant abnormalities. Pay particular attention to the blood pressure. If it is elevated come back and check it later. Often it normalizes once the patient settles into their new environment.

CHEST

Assess the shape of the chest looking for signs of emphysema. Check for scars and that there are no signs of pleural fluid, lung consolidation or bronchospasm.

ABDOMEN

The presence of abdominal scars provides a useful check on the patient's history. They may also indicate that a routine operation will be more difficult than usual and require more operative time because of adhesions.

All patients should have a rectal examination before abdominal surgery. In males note the size of the lobes of the prostate. This information will be of value if the patient develops urinary problems postoperatively. Once in retention, the size of the prostate is much more difficult to assess.

JOINTS AND TEETH

The presence of false teeth or crowns, limitation of movement of the neck and micrognathia will make intubation more hazardous. These features should be brought to the attention of the anaesthetist.

Investigations

The following five investigations should be considered preoperatively.

- Urea and electrolytes. These should be performed if:
  - the patient is on intravenous fluid therapy
  - the patient is on diuretics or steroids
  - the patient has acute or chronic renal disease
  - the patient is diabetic
  - there is a history of heart disease or hypertension
  - there has been recent significant fluid loss
  - you anticipate postoperative fluid therapy to continue for more than 24 h.
- Full blood count. This should be performed if:
  - anaemia is suspected
  - there is a history of malignancy
  - there is a history of cardiac or vascular disease
  - there is haematological disorder like sickle cell trait/disease or a coagulopathy
  - there is a potential for major blood loss.
- Chest X-ray. This is indicated in:
  - suspected malignancy or possible TB
  - likely admission to ITU (major upper abdominal or thoracic surgery)
  - cardiothoracic surgery
  - those with signs or symptoms of significant cardiac or pulmonary disease (excluding asthma) and the very elderly.
- Electrocardiogram (ECG). This should be performed:
  - in known cardiovascular disease (including hypertension)
  - in males over 50 and females over 60 years
  - in those with diabetes or hyperlipidaemia.
- Liver function tests. The serum albumin gives some indication of the state of nutrition of the patient. Other liver function tests may form part of the work-up for general liver disease such as hepatic metastases or cirrhosis.

Other investigations can be considered depending on the operation intended, or findings from the history and examination.

Some common pitfalls in surgical diagnosis and management

Avoid accepting the diagnosis with which the patient has been labelled, until you have confirmed or altered this as a result of your own history and examination.

When taking the history do not blindly accept non-specific terms used by the patient. Define the symptoms they are trying to describe. While a patient might tell you they have had pleurisy, simple questioning may reveal that this included haemoptysis, shortness of breath and pleuritic chest pain (more indicative of a pulmonary embolus) and this will affect your management. Be careful with words like 'diarrhoea' or 'indigestion'. Get the patient to explain carefully what they mean.

Be aware of the patient's previous medications. Find out which can be stopped, which must continue (using alternative forms if appropriate) and which may have affected the patient's electrolyte balance (such as diuretics).

1.2 Preparing the patient for operation

Preoperative management

The following is a useful checklist to run through for each patient on the next day's operating schedule.

Identification

Check that the *correct* patient is having the *correct* operation on the *correct* side.

The As, Bs and Cs

ANAESTHETIST

The anaesthetist needs to be told a number of facts on the afternoon of the day before surgery.

- A brief summary of the patient's general health, outlining any relevant problems, past medical history, drugs and examination findings.
- The proposed surgery.
- The position of the patient on the list.
- When the patient last ate or drank (in emergency cases). The anaesthetist also needs to be asked.
- If he or she will be writing up the premedication.
- If he or she requires any further preparation.

ANTIBIOTICS
Is cover required? See p. 103.

ANTICOAGULATION
Does the surgeon require the patient to have prophylactic anticoagulation? See p. 105.

ALLERGY
Latex sensitivity and known drug allergies should be clearly indicated on the operating list.

BLOOD
Is the haemoglobin available?

BIOCHEMISTRY
Are the electrolytes available and within the normal range? Regular blood sugar results should be available in diabetics.

BACTERIOLOGY
Make sure the results of culture swabs are available on any patients who have preoperative sepsis. Check MRSA if relevant.

CROSS-MATCH
Many patients scheduled for elective surgery attend preoperative assessment clinics. This provides an opportunity to take blood for group and save. Provided that patients do not have unusual antibodies most hospital transfusion services can provide cross-matched blood at short notice (within an hour). For this reason many elective procedures where transfusion may be required are

commenced using the group and save sample and blood subsequently cross-matched as needed.

In specific circumstances it may be necessary to cross-match blood beforehand and recommended volumes are indicated in each procedure profile. Individual practice varies so check with the surgeon doing the operation.

CHEST X-RAY
If required.

CARDIOGRAM
If required.

CONSENT AND MARKING
Make sure an appropriate member of the team obtains the patient's consent to the procedure (see p. 124). Check that the patient and their main carers (usually relatives) understand what is going to happen over the next few days. Each operative procedure is described and profiled in this book to help you do this. Mark such things as hernias, lumps in the breast, varicose veins and small 'lumps and bumps' using a permanent skin marker.

Investigations

Make sure that the results of all the diagnostic investigations that have been asked for preoperatively are available before the operation starts. These often contain some surprises that affect what should be done.

Organizing the operating list

Having admitted each individual patient, you should check that the operating list has been organized and submitted. Other departments may need to be contacted (e.g. radiology and pathology).

The following headings summarize the main steps and may be used as a checklist. This should be done on the day before the operations are scheduled.

SURGEON

Be sure you know the following from the surgeon.

- All the patients on the list.
- What operation is intended for each patient. Check you know the precise description and the most complicated alternative procedure likely to be performed. Find out whether any special instruments or preoperative investigations will be needed.
- The order of the list.
- What time the surgeon wants to start.
- In cases where you are uncertain, check whether blood is required.

ANAESTHETIST

Is he or she fully informed as on p. 8?

ASSISTANT

One assistant of adequate experience should be available (some procedures will require more).

THEATRE

All the information collected needs to be passed on to the theatre staff. This is done by providing an operating list (Fig. 1.2.1). They need to know the following.

- The surgeon's name.
- The anaesthetist's name.
- The name and age of the patients (children require special instruments).
- The order of the list. Write clearly with no abbreviations. Always indicate the side of the operation in capital letters. Indicate any allergies or conditions that pose extra risks to healthcare personnel or where special decontamination of equipment might be needed.
- The operation intended, and any alternatives thought likely.
- Any special equipment needed, e.g. nerve stimulator.

WARDS

A copy of this list is sent to all the wards involved.

LIST OF OPERATIONS

DATE 24. 12. 91 SURGEON: Mr Cutfaster ANAESTHETIST: Dr Snooze

TIME 8.30 a.m. THEATRE 8

Number	Patient's name	Number	Age	Ward	Operation
1	Andrew SMITH	54321	6 months	D2	LEFT inguinal hernia (baby)
2	Jane BLOGGS	68624	55	D8	Cholecystectomy and exploration of common bile duct. Operative cholangiogram.
3	Susan McARTHUR	72643	60	D8	Laparotomy for abdominal mass. ?RIGHT hemicolectomy ? oophorectomy.
4	Henry SMITH	629953	39	D8	RIGHT nephrectomy for hypernephroma ? Exploration of inferior vena cava.

Fig. 1.2.1 Specimen operating list.

PEROPERATIVE INVESTIGATION

The relevant departments need to be informed of any special investigations that will be undertaken during an operation, such as histopathology for frozen section, radiology for operative cholangiogram.

BLOOD

Blood should be considered a potentially hazardous item, and should be transfused only if absolutely necessary.

1.3 The management of patients with pre-existing medical diseases

It is important to identify any patients with an illness that could influence the postoperative course, and to do so in time to allow adequate treatment before the operation. The procedure may have to be delayed until the patient is made as fit as possible.

The following medical conditions and patients will be considered in this chapter:

- respiratory disease: acute and chronic
- cardiovascular disease
- diabetes
- patients on steroids

- patients on anticoagulants
- haemophilia and other coagulation disorders
- blood-borne diseases
- acquired immune deficiency syndrome (AIDS).

Respiratory disease

ACUTE

Coughs, colds, sore throats and acute infections are all contraindications to elective surgery. Recovery usually takes place very quickly, especially in children, and unless the operation is urgent it should be delayed until the patient is fit. This usually means a delay of 2–4 weeks. The final decision as to whether a patient is fit for anaesthetic is left to the anaesthetist.

CHRONIC

Any patient with chronic obstructive pulmonary disease (COPD) has an increased risk of developing problems after an operation. Factors adversely affecting the chest include immobility, abdominal distension, inability to cough due to pain and suppression of the cough reflex by analgesics.

The risks are increased by certain factors.

- The nature and extent of the disease. Chronic airways obstruction is more of a problem than restrictive chest disease.
- The severity of the operation. A prolonged anaesthetic or postoperative recovery enhances the risk of chest infection.
- The site of the operation. Chest problems are more common after thoracic or abdominal operations, where coughing is very painful in the absence of suitable analgesia.
- Type of anaesthetic. General anaesthetics potentially cause more problems than local anaesthetics.
- Continued smoking. Increased secretions occur if smoking continues up to the time of surgery. Postoperative atelectasis is therefore more likely to occur.

Assessment

Patients at risk should be recognized and the severity of their condition assessed by history (How far can you walk on the level?

Can you climb a flight of stairs? Is it usually shortness of breath that stops you?), examination and special investigation.

- Full blood count. The haemoglobin may be elevated reflecting secondary polycythaemia due to chronic hypoxia. This indicates severe respiratory impairment.
- Blood gases. Both hypoxia and hypercapnia in a blood gas sample reflect severe respiratory impairment.
- Chest X-ray. This is an important preoperative baseline investigation for comparison with later postoperative X-rays, especially for patients with pre-existing lung disease.
- Respiratory function tests.
  - Spirometry measures the rate at which a patient can exhale. The patient is instructed to take a full inspiration and then blow as hard and for as long as possible into the mouthpiece. The instrument plots the volume exhaled against time. From the best plot obtained one can determine the volume of air exhaled in the first second (FEV1 = forced expiratory volume in the first second) and the total volume exhaled (FVC = forced vital capacity).
  - The peak expiratory flow rate (PEFR) is another simple measurement and is related to the FEV1. Normal values depend on age, weight and sex, and nomograms are available.
  - A useful measure from the graph is the ratio of FEV1 to FVC. (Normal value is above 75%.)
  - Airways obstruction or volume restriction affects the shape of the graph in a characteristic way (Fig. 1.3.1). Airways obstruction reduces the rate at which air can be expelled more than the total volume. Thus the ratio of FEV1 to FVC is less than 75%. If it is less than 50% significant obstruction is present and an attempt should be made to improve the situation before anaesthesia. Previous vitalographs may also be useful for comparison.
  - Restrictive airways disease (e.g. fibrosing alveolitis). The vital capacity is decreased more than the FEV1 and the ratio may therefore be above 75%.

Management

PREOPERATIVE

- The patient should stop smoking at least 1 month before surgery. The attempt to stop must therefore be made from the

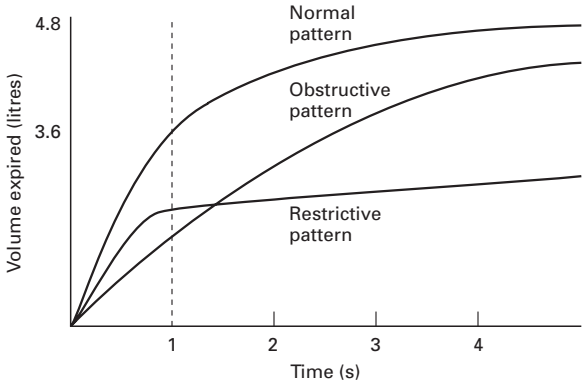


Fig. 1.3.1 The vitalograph plots the volume exhaled against time.

outpatient appointment. Explain that they are likely to develop pneumonia after their anaesthetic if they continue smoking. Most patients understand this and try to do something about it.

- Preoperative treatment may be possible and may be available from the physiotherapy department. This consists of the following:
  - physiotherapy – this may be both active (breathing exercises and loosening of secretions) and passive (postural drainage)
  - bronchodilators – there is usually an element of reversible airways obstruction and bronchodilators are therefore used. Nebulized salbutamol (2.5 mL 0.1% solution 4-hourly by inspiration) is effective. Aminophylline suppositories at night help nocturnal dyspnoea and bronchospasm
  - perioperative steroid use could be considered
  - antibiotics – these may be given if surgery is necessary in a patient with chronic pulmonary sepsis, but in general should be avoided as they encourage emergence of resistant strains.
- If possible, perform procedure under local or regional rather than general anaesthesia.
- Consider the risks and benefits carefully when a prolonged operation might be needed or one that exposes the lungs to additional risk (e.g. reperfusion of the lower limbs in arterial reconstructive surgery).

POSTOPERATIVE

- Encourage early mobilization as this will improve chest expansion and decrease ileus.
- Continue active physiotherapy.
- Good analgesia enables an effective cough to clear secretions. Various excellent postoperative systems are available, including epidurals and patient-controlled analgesia. A pain team may be available to help monitor postoperative pain.
- Examine the chest regularly to identify atelectasis and sputum retention.
- Bronchodilators.
- Prompt treatment of infection. Watch for signs of infection such as increased respiratory rate, pyrexia, purulent sputum and shortness of breath. Give broad-spectrum antibiotics after taking appropriate cultures. Change if necessary once sensitivities are known.

Asthma

Asthma is characterized by reversible airways obstruction. It may be precipitated by an allergen, exercise or cold. There may be no obvious precipitating factors.

Assessment

Find out about the following.

- Any known precipitating factors.
- The frequency and severity of attacks and the treatment needed to reverse them.
- What normal maintenance treatment is required to prevent attacks.

Management

- A mild well-controlled asthmatic is rarely a problem.
- Severe asthmatics may need to be admitted early to allow time for assessment and for the patient to settle on the ward.
- Reassurance and good premedication are important as anxiety may precipitate an attack.
- Discuss the case with the anaesthetist and ask if he or she wants any particular preoperative medication, such as nebulized salbutamol or steroid cover.

- Listen for bronchospasm postoperatively and treat it early. Similarly, treat any developing chest infection quickly.

Cardiovascular disease

The following problems will be considered.
- Myocardial ischaemia:
  - infarction
  - angina.
- Hypertension.
- Left ventricular failure.
- Cardiac dysrhythmias, e.g. atrial fibrillation.
- Heart murmurs.

These pre-existing conditions should be identified during the history and examination. If present, a full cardiovascular assessment is required.

Assessment

All patients with a cardiovascular abnormality should have the following investigations.
- Haemoglobin to exclude anaemia.
- Biochemistry (urea and electrolytes) to exclude electrolyte imbalance.
- Chest X-ray:
  - assess heart size and shape
  - look for pulmonary congestion
  - look for unfolding of the thoracic aorta (seen in longstanding hypertension)
  - look for calcification in the cardiac valves or aorta.
- ECG:
  - look for evidence of dysrhythmia
  - look for changes of ischaemia
  - look for conduction defects.

Management

MYOCARDIAL INFARCTION

An elective operation should not be undertaken in the first 6 months after a myocardial infarct, as there is a substantial risk

of perioperative re-infarction and death during this time. The risk is increased if the patient is hypertensive, if the operation is likely to be prolonged or if the operation involves thoracic or abdominal surgery. Patients who have had a myocardial infarction more than 6 months previously have a small risk of re-infarction.

ANGINA

- Assess its severity using the following parameters:
  - the frequency of attacks
  - the duration of attacks
  - the state of improvement with rest or glyceryl trinitrate
  - how severe the circumstances were that brought on the attack.
- Inform anaesthetist and surgeon. If appropriate, refer to a cardiologist for consideration of investigation, and delay operation.
- Intraoperatively severe swings of blood pressure should be avoided.
- Postoperatively give adequate analgesia and avoid fluid overload.

HYPERTENSION

Patients receiving treatment for hypertension usually stay on this treatment while in hospital. It is important that the anaesthetist knows which drug is being used as it will influence the management (e.g. β-blockers may mask any sympathetic response to hypotension). He or she will also have to decide whether any alternative therapy should be given when the patient is taken off oral drugs just before operation. Sudden cessation of certain drugs can lead to rebound hypertension.

Check the blood pressure is well controlled. It may need to be taken on at least two occasions preoperatively.

If the patient is on long-term diuretics check the electrolytes. Such patients are often sodium- or potassium-depleted.

Look for secondary effects such as left ventricular hypertrophy, myocardial ischaemia, ECG changes and impaired renal function.

LEFT VENTRICULAR FAILURE

If this is acute it should be brought under control prior to surgery. The help of medical colleagues should be sought. If it is chronic, the following must be done.

- Assess the present degree of failure. An ECG is helpful to determine left ventricular function and to exclude ischaemia as the cause of failure. A transoesophageal echocardiogram provides additional quantitative information about ventricular function and gradients across valves.
- Note the treatment the patient is receiving.
- Check the urea and electrolytes and relay this information to the anaesthetist.
- Postoperative fluid management is difficult. It may be an advantage to run the patient rather more dehydrated than usual.

DYSRHYTHMIA (e.g. ATRIAL FIBRILLATION)

Acute dysrhythmias are often precipitated by surgical emergencies and the treatment of these is best discussed with the anaesthetist. Chronic dysrhythmias are usually stable but the anaesthetist should be informed of current treatment.

HEART MURMURS

Define the murmur by clinical assessment and evaluation of the ECG, chest X-ray and echocardiogram. If you are in any doubt about the interpretation of the murmur seek expert advice. Check the patient's notes for evidence of previous problems.

VALVULAR DISEASE AND SEPTAL DEFECTS

- Treat any cardiac failure or dysrhythmia.
- Antibiotics. Any diseased valve may act as a site for subacute bacterial endocarditis. Its surface may be colonized by organisms during a transient bacteraemia. Therefore prophylactic antibiotics are given to those patients with a murmur who are having the following procedures:
  - upper respiratory tract, oral or dental surgery (*Streptococcus viridans*)
  - interventional GI endoscopy
  - biliary surgery
  - large bowel surgery
  - cystoscopy, prostatectomy, genitourinary surgery (*S. faecalis*)
  - abortion (*S. faecalis*).

Follow local protocols for prophylactic antibiotics.

- As in all cardiac disease, avoid any hypovolaemia or fluid overload.

Diabetes

Diabetic treatment is normally planned and adjusted for the individual patient to follow their usual lifestyle, while maintaining a normal blood sugar. Admission for a surgical operation disturbs this balance of 'treatment versus lifestyle', due to the catabolic response to surgery. Diabetics also have an increased risk of developing problems at the time of surgery due to the following factors.

- Infection.
- Cardiovascular disease.
- Renal disease: diabetic nephropathy may affect the elimination of drugs by the kidney.
- Autonomic neuropathy: this causes postural hypotension, affects the bladder causing retention, and has been implicated in sudden cardiorespiratory arrest in diabetics undergoing surgery.

Assessment

Determine the severity and stability. In addition look for evidence of diabetic complications. Assess the following.

- Cardiac function (by history, examination, chest X-ray and ECG).
- Renal function (by measurement of the blood pressure, looking for the presence of oedema, testing the urine for protein and checking the serum urea and electrolytes).
- The neurological system (look for autonomic neuropathy by taking the blood pressure lying and standing).

Ideally, diabetic patients needing major surgery should be admitted 24 h before the operation for assessment and stabilization. More time will be needed if their method of diabetic treatment is to be changed (see below).

Management

The aim of management is to maintain good control and prevent ketoacidosis and hypoglycaemia. Ketoacidosis is prevented by supplying adequate calories and insulin, and hypoglycaemia is prevented by ensuring that the insulin given is covered by sufficient glucose input. Hypoglycaemia is to be strenuously

avoided. If it occurs under anaesthetic and is not picked up, brain damage may occur.

Patients can be divided into three main groups:

- diabetics controlled by diet
- diabetics controlled by oral hypoglycaemics
- insulin-dependent diabetics.

Procedures can be divided into:

- minor operations, where the patient may eat as soon as they wake up
- major operations, where the patient may have no oral intake for a variable length of time postoperatively.

The precise management will depend on which combination of these factors is present.

DIABETICS CONTROLLED BY DIET

- Minor operations: no specific measures.
- Major operations.
  - Measure the blood sugar just before anaesthetic.
  - Regular 3–4-hourly blood sugar measurements postoperatively for 24 h.
  - Usually there is no problem, but the combination of stress and bed rest may cause a rise in blood sugar and make the patient temporarily insulin-dependent (p. 22).
  - For patients withdrawn from oral feeding, a standard intravenous regime (e.g. 1 L of normal saline, 2 L of 5% dextrose, each with 20 mmol potassium) will give the patient 100 g of carbohydrate. Insulin may or may not be added to this.

DIABETICS CONTROLLED ON ORAL HYPOGLYCAEMICS

- Minor operations.
  - No hypoglycaemics on the day of operation.
  - Measure blood sugar just before anaesthetic, postoperatively and 4 h later.
  - Restart oral hypoglycaemics as soon as oral intake is established.
- Major operations.
  - Patients must be stabilized and managed on short-acting insulin. Ideally they should be admitted 24–48 h before the operation for conversion to a short-acting soluble insulin.

- Further management is then as for patients on insulin.
- The effects of oral hypoglycaemics may last many hours and insulin requirements will vary. Therefore use a sliding scale of insulin.

INSULIN-DEPENDENT DIABETICS

Discuss the preoperative management with the anaesthetist. There are different ways of managing such diabetics and the anaesthetist may well have a preference.

- Minor operations.
  - If possible plan the operation early in the list.
  - Omit any long-acting insulin the night before the operation.
  - Omit the morning dose of insulin. Set up an intravenous infusion for the pre- and perioperative period of 1 L of 5% dextrose with 16 units Actrapid and 20 mmol KCl, infused at 100 mL/h. Patients having small operations later in the day can have a light breakfast covered by half the normal dose of insulin in the morning. They are then starved and an infusion is set up as above.
  - Check the blood sugar before operation, immediately after operation and 4-hourly until the patient is eating normally.
  - As soon as oral intake is re-established after the operation, restart the insulin.
- Major operations. There are many possible regimes for intravenous insulin administration. One regime is shown in Table 1.3.1, but your anaesthetist may prefer to use a different one.
  - Plan the operation early in the list.
  - The day before the operation give the patient their normal dose of insulin in short-acting form.
  - On the morning of the operation start an intravenous infusion of 5% dextrose (1 L) with 16 units Actrapid and 20 mmol KCl, infused at 100 mL/h.
  - Postoperatively, the insulin is given by continuous infusion from an insulin pump 'piggy-backed' into the side of the drip. 50 units Actrapid in 50 mL 0.9% saline (strength 1 unit/mL) are administered according to the scale shown in Table 1.3.1. One litre 5% dextrose is infused intravenously concurrently over 8–10 h. The saline requirement is given through a second line. Potassium requirements can be added as usual.

Table 1.3.1 Sliding scale for insulin infusion rate according to hourly blood sugar measurement.

Ward glucometer test (mmol/L)	Insulin i.v. (units/h)
< 2	Give 50 mL 50% glucose i.v
2–5.9	None
6–8.9	0.5
9–10.9	1.0
11–16.9	2.0
17–28	4.0

- This system needs good nursing care as the glucose and insulin are given independently and there is a risk that they may get out of phase (in particular, there is a danger of hypoglycaemia).
- An insulin infusion is ideal, especially for a long period of care when the patient is going to have no fluid or restricted fluid by mouth.
- Once the patient begins to drink and becomes re-established on a diet, a twice- or thrice-daily soluble insulin regime can be restarted and adjusted according to blood sugar levels.
- The initial total daily insulin should roughly equal the patient's preoperative dose. It should be increased by about 20% in the presence of infection or when the patient is taking high-dose steroids. The dose may need doubling or quadrupling if the patient is severely ill.
- Measure the blood sugar hourly postoperatively until stable, adjusting the infusion rate according to the above chart. Once stable, measure it 2–4-hourly. Monitor the potassium levels.

EMERGENCY SURGERY IN DIABETICS

- Diet-controlled diabetics and those on oral hypoglycaemics can usually be managed by putting up a 5% dextrose infusion and administering subcutaneous Actrapid, according to a sliding scale.

- Insulin-dependent diabetics and those who are extremely ill should have an insulin dextrose infusion as outlined. It is usually better to run the blood sugar a little too high, rather than a little too low.
- Ketoacidosis can mimic the acute abdomen. Therefore patients should be stabilized and reassessed prior to operation.

Patients on steroids

If the patient has been on regular steroids in the 6 weeks preceding the operation they may have adrenal suppression and be unable to respond to stress and trauma in the usual way. Additional steroid cover is then required.

The dose given is influenced by the severity of the operation and the length of the previous steroid treatment. A commonly used regime for a major operation is listed below.

- Hydrocortisone 100 mg i.m. with premedication.
- Hydrocortisone 100 mg 8-hourly over the day of the operation.
- Hydrocortisone 50 mg 8-hourly on the second postoperative day.
- Hydrocortisone 50 mg 12-hourly on the third postoperative day.
- Then 25 mg 12-hourly gradually decreasing to the patient's normal dose over a further week. It is useful to remember that 5 mg of prednisolone is equivalent to 20 mg of hydrocortisone.
- If the patient's blood pressure falls postoperatively and other causes have been excluded, suspect adrenal insufficiency and give extra hydrocortisone (100 mg hydrocortisone i.v.) until the blood pressure is restored.

Patients on anticoagulants

The precise management depends on the policy of the local surgical unit, anaesthetists and haematologists. Patients are usually on anticoagulants as prophylaxis against venous thrombosis or arterial emboli. In each case a fine balance needs to be kept between effective anticoagulation and minimal risk of haemorrhage during surgery.

The anticoagulant effect of both heparin and warfarin can be reversed. The action of heparin is reversed with protamine sulphate. The action of warfarin is reversed with fresh frozen plasma (FFP) and vitamin K.

The management of a patient on warfarin will depend on the reason for warfarinization. Those with prosthetic heart valves should be managed more precisely than those on warfarin for atrial fibrillation.

In some patients it may be suitable to omit warfarin for 2–3 days and operate when the international normalized ratio (INR) falls to approximately 1.6. Others may need to be fully stabilized on heparin prior to elective surgery. In the emergency setting use FFP and small doses of intravenous vitamin K (in consultation with the haematologist) to achieve an INR of less than 2.

Antiplatelet agents like aspirin or clopidogrel may need to be stopped a week before the operation in discussion with the surgeon and the anaesthetist.

Haemophilia and other coagulation disorders

Classical haemophilia is due to a deficiency of factor VIII. Christmas disease is due to a deficiency of factor IX. The severity of the condition varies between different patients, but all need special management when surgery has to be undertaken. Capillary bleeding initially ceases due to platelet aggregation (primary haemostasis). Because of the factor deficiency, the clotting cascade is inadequately activated and insufficient fibrin is produced to stabilize the clot. Continued bleeding therefore occurs in the postoperative period unless replacement therapy is given.

Management

This should be discussed with the haematologist pre- and perioperatively.

It is increasingly recognized that congenital and acquired disorders of coagulation are common causes of postoperative thrombosis. Such conditions, frequently due to a reduction of the level of naturally occurring anticoagulants (such as protein C, protein S and antithrombin III) will require careful pre- and

postoperative management. Once again a personal or family history of deep venous thrombosis or pulmonary embolism, especially before the age of 40 years, will give a clue as to whether further detailed investigations are required.

Blood-borne diseases

Healthcare professionals have quite rightly become concerned about the transmission of certain diseases from patients to those dealing with them or with their specimens. Contamination with human immunodeficiency virus (HIV) and hepatitis B and C most commonly require consideration. As doctors we are at particular risk of transmission from patients' blood, either from needle-stick injuries during cannulation or from major contamination in theatre. Blood-borne disease does not gain entry through intact skin.

For some diseases all those at risk can be immunized (e.g. hepatitis B), and occupational health departments are active in ensuring this. Other diseases, while detectable, have no known vaccine, and new diseases may have emerged by the time you read this book.

The only practical solution therefore, is to minimize the risk of exposure by adopting certain 'universal' precautions.

- Cover all open wounds with appropriate dressings.
- Wear gloves when coming into contact with patient body fluids.
- Avoid contact with sharps. Avoid resheathing needles, use sharps bins for needles, syringes and scalpel blades, and use other instruments when manipulating sharps (no-touch technique).
- In theatre use a sharps receiver to pass scalpels and needles to one another.
- In theatre wear eye protection to avoid contamination via the conjunctiva.

OCCUPATIONAL EXPOSURE TO HIV

Report needle-stick injuries immediately to the relevant authority. Recent evidence suggests that the risk of acquiring HIV after a contamination incident is reduced by postexposure prophylaxis with indinavir, lamivudine and zidovudine. You and the

patient may then be tested after relevant counselling. If you do have the misfortune to acquire a disease, testing will enable you to prove your seroconversion was occupationally related. This could be important in future compensation or insurance claims.

Acquired immune deficiency syndrome (AIDS)

AIDS, caused by HIV, is a major disease which has profound implications for both patients and staff. Infection can be acquired by drug abuse, sexual intercourse or treatment with blood products contaminated with HIV.

Transmission of the disease occurs with difficulty and requires intimate contact with infected human blood, serum or semen. Once infection has occurred, the virus may remain dormant for many years. Eventually, most, if not all, carriers develop immune deficiency syndrome in which there is an absence of T-cell helper activity. This syndrome can present in a wide variety of ways due to lowered resistance to other infections. These may involve any of the surgical specialties. Among the common presentations are atypical pneumonia (pneumocystis), orogenital candidiasis, progressive lymphadenopathy and Kaposi's sarcoma. Although at the time of writing there is no cure for this infection, active treatment can improve the patient's length and quality of life. Patients have a right to confidentiality, particularly as there is still intolerance by society to this diagnosis.

Recognizing the pattern

The diagnosis should be considered in any patient presenting with an unusual condition who might be in a high-risk group for infection. The main high-risk groups are:

- homosexual males
- bisexual males
- intravenous drug users
- haemophiliacs
- recipients of blood products before 1985 (when HIV testing of donated blood started)
- residents of African countries south of the Sahara
- sexual partners of any of the above

- children of infected mothers
- prison inmates, past or present.

Heterosexual transmission is now increasingly recognized.

Proving the diagnosis

Check for antibodies (the patient's informed consent must be obtained before HIV testing). HIV antibodies appear in serum up to 3 months after infection. The patient can transmit infection during the seronegative phase. HIV antigen can also be detected in serum, but this test is less widely available than that based on the antibody.

Management

It is unethical for a doctor to refuse treatment to a patient infected with HIV on the grounds that there is a risk of the doctor becoming infected (General Medical Council 1988). Therefore adequate precautions must be taken to prevent cross-infection from any patient by the means listed under 'Blood-borne diseases' (p. 26).

1.4 The operation and afterwards

The junior surgical trainee in theatre

As junior surgical trainee you should ensure that the operating list runs as smoothly as possible. Hospitals and surgical units vary in their requirement for you to be present in theatre for the list. Although the surgical ward is often busy, we believe that there is also an important role to play in theatre, as well as vital training for anyone hoping to specialise in surgery.

When possible, visiting the operating theatre to observe part of a procedure will provide you with a far better impression of what was done than you will get from reading an operation note.

Before scrubbing up do the following.

- Check whether the patient requires a bladder catheter.
- Check that any necessary preoperative antibiotics have been given.
- Fill in a histology form for frozen section if this is required.

- If the operating list is running late, inform any other department that might be affected, e.g. those providing peroperative radiology or frozen section histology.

Pagers and mobile telephones can be distracting to the surgeon and should not be worn in theatre.

ASSISTING AT OPERATION

The principle of assisting is to make the operation as easy as possible for the surgeon. If you are the first assistant try and follow the operation, imagining you were having to do it yourself, and thus anticipating what is required.

When sutures are being tied have a pair of scissors ready to cut the ends when asked to do so. Always use the tips of the scissors. If you use the blade higher up there is a danger of inadvertently cutting neighbouring structures as the tips close. Skin sutures should be cut so that the ends are as long as the distance between each suture. In this way they can be seen easily for removal, but are not in the way of the next knot. For internal sutures ask how long the surgeon would like the ends cut, as this will vary with the type of material used.

Ensure that the area the surgeon is operating on is as well exposed as possible, using suitable retractors or forceps to display the structures. Keep the field clear of blood using swabs or suction.

Never try and 'dictate' what the surgeon should do next; simply make it as easy as possible for them to achieve what they have decided to do.

There is usually less to do as a second assistant. With most modern retractor systems there is little need for someone to stand holding a retractor for hours on end. In some complex procedures, though, a second assistant can be a great help. Good demonstration of the operative field may make all the difference between a successful or unsuccessful operation for your patient. Do it willingly and cheerfully.

THE IMMEDIATE POSTOPERATIVE PERIOD

The junior surgical trainee should check the following things after each operation.

- Laboratory specimens. Have they been labelled and the forms signed? Make sure any microbiology specimens have gone to the laboratory.

- Operation note. Has it been written? Are instructions to recovery and ward staff clear?
- Prescription chart. Check this in order to be certain that:
  - adequate analgesia and night sedation are written up
  - an intravenous fluid regime is written up if the patient requires it.
- Intravenous lines, arterial lines, drains and catheters. After a large operation make a mental note of the position of these. Are they all necessary in the postoperative period and how long will the surgeon require them to be left in?
- Nursing observations. Note which observations are required postoperatively and inform the nurses of any particular problems such as the presence of a chest drain or drains requiring measurement of output.

Conducting regular postoperative ward rounds

The junior surgical trainee should see every patient under his or her care at least once a day. This enables you to keep in touch with the patient's progress, and to pick up any postoperative problems as they arise.

The following is a basic plan for such a round, designed to check quickly on every aspect of patient care. If you find something positive the methods of management can be followed up in sections 1.5–1.9.

HISTORY

Ask about pain and vital functions.

- Pain: if the patient has any new or unexpected pain, identify the cause. Ask particularly about pain in the legs or chest (thromboembolism), or increasing pain in the wound (wound infection). Has adequate analgesia been prescribed?
- Breathing: shortness of breath, cough, haemoptysis.
- Eating: appetite, nausea, vomiting.
- Bowels: passage of flatus, motions.
- Urine: has the patient passed urine? Has the patient had any dysuria or difficulty?

EXAMINATION

Check the following.

- Temperature charts for pyrexia, change in pulse rate, blood pressure and respiratory rate.
- Chest: examine for signs of infection, collapse or oedema.
- Wound: check for developing localized tenderness.
- Bowel sounds (after abdominal surgery).
- Legs: check for localized tenderness over the soleal muscles.
- Mental state.

FLUID BALANCE

Examine the fluid chart and check the input (oral, i.v.) against the output (urine, nasogastric tube, drains and insensible loss). Is the patient in positive or negative fluid balance?

DRAINS AND TUBES

Check the position of intravenous lines, drains and any urinary catheter. Are they all draining? Can any be removed? Have any become infected?

DRUGS

Check the prescription sheet for any unnecessary drugs which can be deleted.

INVESTIGATIONS

Order any tests which may be necessary (e.g. haemoglobin, urea and electrolytes, serum proteins). These should all be clearly documented in the notes.

1.5 Postoperative complications: presenting symptoms

Some of the common problems you will be called upon to deal with in the postoperative period are dealt with in this section. They are listed in Table 1.5.1. Further notes on subsequent management are given in sections 1.6–1.9.

Table 1.5.1 Common postoperative problems.

Common presentations	Causes	Page
Pyrexia	Pulmonary collapse or bronchopneumonia	43
	Wound infection	65
	Intra-abdominal abscess (pelvic or subphrenic)	70
	Urinary tract infection	58
	Inflamed drip site	70
	Thromboembolism	52
	Blood transfusion reaction	47
	Septicaemia	77
Postoperative pain	Wound haematoma or infection	65
	Chest	35
	Abdomen	35
	Legs	35
Discharging wound	Abscess	65
	Fistula	64, 74
	Dehiscence	68
Nausea and vomiting	Drugs	35
	Intestinal obstruction	308, 370
	Acute dilatation of the stomach	42
Constipation	Paralytic ileus	41
	Drugs	36
Breathlessness	Pulmonary collapse	43
	Bronchopneumonia	43
	Pulmonary embolism	54
	Left ventricular failure	50
	Pneumothorax	45
Confusion		37
Collapse	Inhalation of vomit	45
	Haemorrhage	46
	Septicaemia	77
	Pulmonary embolus	54
	Myocardial infarction	49
	Stroke	50
Oliguria/anuria	Postrenal, renal and prerenal failure	61
	Retention of urine	59

Postoperative pyrexia

The temperature chart is a very good indicator of developing postoperative problems and should be inspected every day. The time of onset of the fever will help you decide the cause.

Early postoperative fever, days 0–2

A mild pyrexia in the first 24 h after operation is commonly due to tissue damage and necrosis, or haematoma formation at the operative site. A higher and more persistent pyrexia may be due to pulmonary collapse, or specific infections related to the surgery, e.g. urinary infection after bladder surgery or biliary infection after a cholecystectomy. A fever due to blood transfusion may also appear in this early period.

Fever, days 3–5

A pyrexia developing in this period is likely to be due to either developing sepsis (e.g. wound infection or pelvic or subphrenic abscess formation) or bronchopneumonia.

Fever, days 5–7

Problems presenting at this time include those associated with failure of a bowel anastomosis, e.g. leakage and fistula formation, and a fever due to venous thrombosis either in the limbs or in the pelvic veins.

Fever after the first week

This is less likely to be due to a problem directly related to the operation, although the development of wound or deep sepsis can be delayed if the patient has received prophylactic antibiotics. Other causes include the development of distant sepsis such as a hepatic abscess or cerebral abscess. Thrombotic disease may also be delayed in onset and appear at this time.

If you cannot find an adequate explanation for a fever at any time, assume that something has gone wrong with the operation (e.g. a leak) until you can prove conclusively otherwise.

Recognizing the pattern

Carry out the following routine.

- Ask about symptoms of cough, sputum, dysuria, urinary frequency or calf pain.
- Examine:
  - the respiratory and pulse rates
  - the chest
  - the wound
  - the drip site and drain sites
  - the calves for tenderness localized over the soleus muscle
  - the abdomen if an abdominal operation has been performed.
- Investigations: culture specimens of sputum, urine, blood (if temperature above 38°C), take a wound swab and perform a chest X-ray.

Management

Some common causes of postoperative pyrexia are shown in Table 1.5.1. Further details of these conditions are given in subsequent chapters.

Postoperative pain

Pain relief is almost always required in the postoperative period and analgesic therapy is discussed on p. 98. The cause of any pain must be determined in the same way as in other circumstances but there are certain characteristics in a postoperative patient.

Wound pain

Pain in the wound is worse on movement and is usually maximal in the first 72 h. Thereafter it usually settles. If the pain is getting worse after this, check for signs of a wound infection, either superficial or deep. Occasionally, patients suffer quite severe 'spasms' of pain in an abdominal wound. This is more common in those who are excessively tense.

Management

Appropriate analgesia for wound pain. Diazepam 2 mg 8-hourly is helpful for muscle spasms.

Chest pain

Excluding any pain due to a thoracic wound, two other significant types of chest pain occur postoperatively.

- Pleuritic. Sharp, localized and severe pain increased by inspiration. This may be due to infection involving the pleura or pulmonary infarction after an embolus (see pp. 43 and 54).
- Cardiac pain due to myocardial ischaemia. The patient may complain of crushing central chest pain with or without radiation into the neck and arms (see p. 49).

Abdominal pain

Possible causes of increasing abdominal pain include:

- intra-abdominal sepsis (see pp. 70–74)
- anastomotic leakage (p. 74)
- retention of urine (p. 59)
- constipation (p. 36)
- new intra-abdominal pathology, e.g. ischaemic bowel, intussusception, intestinal obstruction (pp. 308, 370).

Legs

- Deep or superficial venous thrombosis (p. 52).
- Sciatica.
- Postoperative arterial thrombosis or embolism.

Discharging wound

A copious discharge from the wound may be due to the release of a wound abscess. You should also consider the possibility of the development of an intestinal fistula (p. 74), a urinary fistula (p. 64) or a deep wound dehiscence (p. 68).

Nausea and vomiting

The common causes of postoperative vomiting are as follows.

- Drugs:
  - analgesics (opiates)

  - anaesthetic agents
  - other drug therapy, e.g. digoxin toxicity.
- Intestinal obstruction:
  - paralytic ileus
  - mechanical.

Recognizing the pattern
- Note which drugs the patient has received.
- Check possible drug interactions.
- Assess the oral input and listen for bowel sounds. Nausea and vomiting when the patient has just started drinking after abdominal surgery may be due to a persistent paralytic ileus. In this case the abdomen will be distended and bowel sounds absent.
- If nausea and vomiting occur after the patient has been tolerating oral fluids, consider the possibility of a mechanical obstruction. Here there is usually colicky pain with active bowel sounds. An abdominal X-ray will show distended loops and fluid levels with paucity of distal gas on the erect film.

Management
- Pass a nasogastric tube to drain the stomach.
- Paralytic ileus (p. 41).
- Mechanical obstruction (pp. 308, 370).
- Drug-induced vomiting. Treat with an antiemetic (e.g. prochlorperazine 12.5 mg i.m. 4–6 hourly, or metoclopramide 10 mg i.m./i.v. 8 hourly). Cyclizine and ondansetron could be considered in resistant cases. Stop the responsible drug if possible.

Constipation

Constipation occurs frequently after an operation and can cause great discomfort to the patient. A rectal examination is essential. Faecal impaction causes considerable distress and the cause is not always apparent to the patient. The early use of laxatives while the patient is still immobile often avoids the need for enemas or manual evacuation later on.

Opiate analgesics are a major cause of such constipation.

Breathlessness

Breathlessness in a postoperative patient is usually due to one of the following factors.

- Pulmonary collapse (p. 43).
- Bronchopneumonia (p. 43).
- Pulmonary embolism (p. 54).
- Left ventricular failure either due to fluid overload or myocardial infarction (p. 50).
- Pneumothorax (p. 54). This occasionally complicates the insertion of a central venous pressure (CVP) line or intercostal anaesthetic blocks, or may occur spontaneously.

Confusion

It is quite common for a surgical patient, often elderly, to become confused after an operation. This is distressing both for the patient and the relatives. There is usually a cause that may well be amenable to treatment. Causes include:

- hypoxia (bronchopneumonia, pulmonary embolus) – easily the most common
- infection (sepsis, urinary tract infection, chest infection)
- drugs (analgesics, sedatives, steroids)
- withdrawal (alcohol or drug)
- electrolyte imbalance
- uraemia
- pain (wound, retention of urine).

Recognizing the pattern

The symptoms of confusion are disorientation and agitation. Review with the above causes in mind. Always examine the chest. Bronchopneumonia is a frequent cause of confusion in the elderly. Check for a past history of alcohol abuse and see what drugs have been given. Remember that more than one of the causative factors may be operating.

Proving the diagnosis

The investigations may include:

- haemoglobin and haematocrit
- urea and electrolytes
- blood sugar
- blood gases
- microbiology where appropriate, e.g. blood cultures, samples of sputum and urine
- appropriate X-rays.

Management

- Talk to the patient. Gentle reassurance is required. A confused, elderly patient is usually aware of their own strange behaviour and terrified they are going to be permanently insane. Reassure the patient, and also the relatives, as they are usually more upset than the patient (who will not remember the events when they recover).
- Check the drug chart for anything that may be causing the confusion and, if possible, stop the drug concerned.
- Treat any organic cause found.
- If the patient is still agitated or potentially hostile despite the above measures, then sedation may be required, but before you do this, be certain that the problem is not hypoxia. There is no ideal drug to recommend; however, small incremental doses of haloperidol may be used.

Collapse

When a patient suddenly collapses after an operation there is often a degree of panic and it is important to take charge and make a careful assessment.

The collapse is usually associated with cerebral impairment, either due to cerebral depression by anoxia, toxaemia or drugs, or due to a fall in the cerebral blood supply. Whatever the initial cause, the final picture tends to be similar as one system failure results in failure of another (Fig. 1.5.1).

Common primary causes to think of include the following conditions.

- Hypoxia:
  - inhalation of vomit (p. 45)

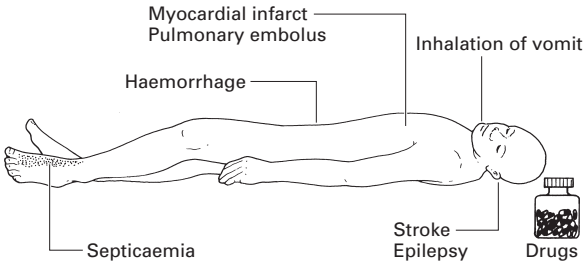


Fig. 1.5.1 Postoperative collapse.

- bronchopneumonia (p. 43)
- pulmonary oedema due to fluid overload in patients with left-sided heart failure
- respiratory depression secondary to opiates or anaesthetic drugs.

- Central circulatory failure:
  - myocardial infarction (p. 49)
  - pulmonary embolism (p. 54).
- Peripheral circulatory failure:
  - haemorrhage (reactionary or secondary) (p. 46)
  - third-space fluid loss (e.g. pancreatitis, mesenteric infarction).
- Toxaemia:
  - septicaemia (p. 77)
  - drug overdose (e.g. opiates, digoxin).
- Cerebral causes:
  - stroke (p. 50)
  - epilepsy.

Recognizing the pattern

Make a quick appraisal of the following.

- Check the airway
- Breathing and oxygenation. Respiration. Rate and character. Quiet or dyspnoeic? Laboured? Tracheal tug? Are there any physical signs in the chest? Pink or cyanosed?
- Circulation. Blood pressure, pulse rate and character. Jugular venous pulse (JVP). Listen to the heart.

- Are the extremities warm (vasodilated) or cold (vasoconstricted)?
- Cerebral function. Level of consciousness.

If the blood pressure and pulse are adequate then the cause is anoxia, toxaemia or a cerebral problem such as a stroke. If there is circulatory collapse (low blood pressure and tachycardia), then you have to decide whether this is due to central (cardiac) failure or peripheral failure (third-space loss or vasodilatation). In central failure there is venous hypertension (raised JVP, peripheral oedema, pulmonary oedema). Peripheral failure may be due to inadequate blood volume (in which case the patient is cold and sweating and the peripheries are vasoconstricted), or due to toxic vasodilatation (in which case the blood pressure is low but the peripheries are warm and well perfused).

Proving the diagnosis

The following investigations may help in making further progress:

- haemoglobin and white cell count
- electrolytes and blood glucose
- ECG
- chest X-ray.

While arranging these remember to cross-match blood if this is likely to be needed.

Management

Initial management involves attention to the airway, high flow oxygen, and setting up an intravenous infusion as necessary. The further management depends on the cause of the collapse.

Oliguria/anuria

It is not uncommon for a patient to have a diminished urine output after a major operation, due to the effects of fluid and blood loss and the physiological response of the adrenal cortex to stress (see intravenous fluid therapy, p. 90). This temporary oliguria should recover after 12–24 h. An output of less than 0.5 mL/kg/h is not satisfactory and should be investigated. It may reflect a deliberate act to prevent fluid overload and this can be accepted if pulse and blood pressure are both normal.

There are three possible causes to consider for poor postoperative urine output:

- retention of urine
- prerenal failure
- acute renal failure.

These are dealt with in section 1.8. Retention of urine is diagnosed by finding a full bladder on examination and confirming this by catheterization. If no evidence of retention is found then renal failure must be suspected and appropriate steps taken.

1.6 Gastrointestinal and respiratory complications

Paralytic ileus

Paralytic ileus is atony of the intestine causing intestinal obstruction. It has a complex aetiology and is common after any operation when the stomach or bowel have been handled, or where there has been peritonitis. The condition is exacerbated by chemical derangement (hypokalaemia, uraemia, diabetes), by reflex sympathetic inhibition (e.g. after retroperitoneal haematoma or injury) or by anticholinergic drugs. It is much less problematic after a laparoscopic procedure.

There may be an ileus for a variable period after open abdominal surgery. Oral feeding can only be restarted once bowel function has returned and you will be called upon to make a decision about this.

Management

Surgeons differ widely in their attitudes towards reintroducing fluids an diet after abdominal operations. Immediately after the operation, unless a nasogastric tube is present, the patient is either kept 'nil by mouth', or only allowed small volumes of water to drink (e.g. 15 mL/h) or ice to suck occasionally. The fluid requirements are given intravenously. The nasogastric tube should be aspirated regularly. You should check that it is draining freely and not blocked. If in doubt, test by giving fluid to drink and then reaspirating it up the tube.

Recovery from ileus is demonstrated by:

- the return of bowel sounds, often accompanied by colic
- passage of flatus
- the patient beginning to feel hungry
- a decrease in the nasogastric aspirate
- an increase in the urinary output as fluid is absorbed from the bowel.

Listen to the abdomen daily. When bowel sounds return, oral intake may be increased. The nasogastric tube can be removed. As the ileus recovers the patient frequently has some abdominal distension and 'wind' pains, and will require reassurance about these. They are relieved when flatus is passed.

If the ileus persists for more than 4 days, there may be some other cause operating such as continuing peritonitis, intra-abdominal abscess formation, anastomotic leakage or mechanical intestinal obstruction. Providing none of the above causes are apparent, encourage the patient to mobilize, pushing their drip stand before them. Rectal suppositories may help. Metoclopramide (10 mg i.m./i.v.) is a good antiemetic, as it not only has central action but also helps gastric emptying. A prolonged ileus may eventually necessitate the introduction of intravenous feeding.

Simple constipation

This is dealt with on p. 36.

Acute dilatation of the stomach

This is a rare complication of any laparotomy. It is occasionally seen in the diabetic patient. There is massive distension of the stomach, which contains several litres of fluid, mucus and air. As distension progresses the duodenum becomes kinked, causing mechanical obstruction to outflow.

Recognizing the pattern

The most important factor is to think of the possibility. Do not be misled by the presence of a nasogastric tube as this may not have been aspirated efficiently. The patient complains of

progressive distension, hiccups and vomiting. The vomiting becomes effortless, and is of dark brown fluid. On examination the upper abdomen is distended. The patient may be dehydrated with a tachycardia and hypotension.

Proving the diagnosis

The diagnosis is proved by successful aspiration of large volumes of dark-coloured fluid.

An abdominal X-ray shows a very large gastric air bubble. A chest X-ray may show a raised left hemidiaphragm and some basal collapse.

The following investigations are important:

- urea and electrolytes to check the potassium
- haematocrit to assess the degree of hypovolaemia.

Management

- The nasogastric tube is left in place and aspirated regularly to keep the stomach empty. The patient immediately feels better. The gastric ileus recovers rapidly once the stomach is decompressed.
- Intravenous fluid is given to provide both the body requirement and to replace that lost by vomiting and aspiration. This should correct the hypovolaemia. Watch the potassium level.

Pulmonary collapse and bronchopneumonia

Pulmonary collapse, or atelectasis (Fig. 1.6.1) is due to the blockage of bronchi with retained secretions and absorption of air from the distal segment. It usually happens within 48 h of operation. If the sputum plug persists then secondary bronchopneumonia ensues.

Recognizing the pattern

The patient may complain of shortness of breath and a dry cough. They may feel there is something they want to cough up but are unable to. On examination the most constant feature is an early postoperative pyrexia which may be quite high (e.g. 39°C). If initial treatment fails to dislodge this blockage, the pyrexia remains high and eventually purulent sputum is produced. The

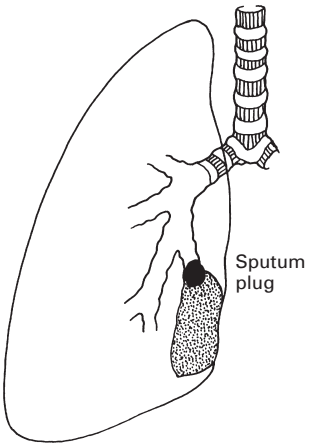


Fig. 1.6.1 Pulmonary collapse.

patient has a raised respiratory rate and a tachycardia. Examination of the chest usually fails to show anything very significant in the early stages.

Proving the diagnosis

The collapsed segment may be visible on chest X-ray after a few days. As soon as a sample of sputum is produced it should be sent off to the microbiologists for culture in case antibiotics are required later.

Management

The condition may be prevented by adequate analgesia and encouraging coughing in the first few hours after operation. If it occurs, however, physiotherapy is used to help the patient cough. This is both active (chest percussion and breathing exercises) and passive (postural drainage). Adequate analgesia is essential if this is to be successful. Nebulized saline can make the mucus less tenacious.

In severe cases bronchoscopy and suction may be indicated. If the pyrexia persists for more than 48 h then antibiotic therapy should be instituted to treat secondary infection.

Inhalation of vomit

This usually occurs in the early postoperative period and may be associated with acute gastric dilatation or a pre-existing hiatus hernia with reflux. Inhalation of vomit causes an aspiration pneumonitis (Mendelson's syndrome). The chemical inflammation causes bronchospasm, pulmonary oedema, and respiratory and circulatory collapse, the extent of which depends on the volume and the acidity of the aspirate.

Recognizing the pattern
There is often a history of unconsciousness, vomiting or difficult intubation. There is progressive deterioration in respiratory function with cyanosis, tachycardia and dyspnoea. There is generalized bronchospasm, poor air entry and diffuse crepitations in the chest. The blood pressure is low and the peripheral vessels are vasoconstricted.

Proving the diagnosis
A chest X-ray shows widespread pulmonary infiltrates.

Management
- Clear the airway.
- Give oxygen.
- Notify the anaesthetist or intensive care team.
- Commence broad-spectrum antibiotics.
- Consider using hydrocortisone and bronchodilators.
- Monitor oxygenation with a pulse oximeter or serial blood gases. If the oxygen saturation deteriorates, consider mechanical ventilation.

Pneumothorax

Pneumothorax can occur during or after an operation. It can arise:
- spontaneously
- due to rupture of the lung occurring during positive pressure ventilation

- following insertion of a CVP line
- if the pleura has been opened accidentally (e.g. in nephrectomy or cervical sympathectomy).

Tension pneumothorax is described on p. 626.

Recognizing the pattern
The chest on the affected side is immobile and hyperresonant with decreased breath sounds.

Proving the diagnosis
The air in the pleural space is visible on a chest X-ray.

Management
A pneumothorax large enough to impair breathing is treated by aspiration or chest drainage. The emergency insertion and management of a chest drain is discussed in section 6.1.

1.7 Cardiovascular complications

Haemorrhage

The condition of postoperative haemorrhage may be one of the following.

- Primary: bleeding at the time of operation from uncontrolled vessels.
- Reactionary: occurs within 24 h of operation. This is from uncontrolled vessels after vasospasm relaxes. Such haemorrhage also occurs as the blood pressure rises after recovery from anaesthesia, and with increases in venous pressure on moving and coughing.
- Secondary: occurs 7–14 days after operation and is due to reopening of a vessel by separation of the thrombus or to erosion due to infection. Such haemorrhage is often preceded by a 'warning' minor bleed.

Recognizing the pattern
The pattern of presentation depends on the rate of bleeding.

MINOR BLEED

With a slow haemorrhage there will be a tachycardia with mild hypotension made worse by an upright posture. The patient often notices blood in the bed or a blood-soaked dressing.

MAJOR BLEED

Acute severe haemorrhage presents as collapse. The patient becomes semiconscious, appearing restless, pale, cold and sweaty. The pulse is weak and there is tachycardia with a low blood pressure and low JVP/CVP.

Look for external bleeding (e.g. from the wound) or increasing abdominal distension suggesting intra-abdominal haemorrhage. Check whether there is blood issuing from any drains.

Early detection of haemorrhage is important as it significantly reduces morbidity and mortality. Regular reliable observations should be carried out on any patient at risk, half- to one-hourly, for at least 12 h after an operation.

Management

- Stop the bleeding. Pressure dressings may help. If the loss is rapid the patient may need to go back to theatre for laparotomy or exploration of the wound. Wound dressings must be changed regularly as blood-soaked dressings are a good medium for infection.
- Replace the lost blood volume. Insert two large-bore cannulae (14 or 16 gauge). Cross-match some blood urgently. Initial fluid replacement can be with crystalloid, plasma expanders or blood as discussed on p. 85. Give oxygen and catheterize the patient to monitor the urine output.
- A chronic slower bleed may require blood transfusion over the next 24 h.

Blood transfusion reactions

A reaction to blood transfusion is quite common and occurs for a number of reasons. The most serious, though least common reaction, is that following transfusion of incompatible blood due to an error of identification. This causes intravascular haemolysis

with haemoglobinaemia and haemoglobinuria and later circulatory collapse, acute renal failure and jaundice. Disseminated intravascular coagulation and a bleeding tendency can develop.

More commonly, milder reactions occur due to the presence of pyrogens in the donor blood, or recipient antibodies to donor white cells. This results in a mild febrile reaction. Atopic individuals may have antibodies to exogenous antigen, e.g. milk or egg protein present in the donor plasma, which may cause an urticarial reaction. This very occasionally causes acute anaphylactic shock.

Recognizing the pattern

A mild pyrexia (37.5–38.0°C) commonly occurs during or within 2 h of blood transfusion. It is usually harmless, lasting a few hours, and the patient is otherwise well. Sometimes, an itchy urticarial rash may develop. There may be a past history of allergy.

The symptoms and signs of a haemolytic reaction include pain in the transfused limb, constricting pain in the chest and pain in the loins. On examination there is flushing, pyrexia, rigors, hypotension and bronchospasm. There may be persistent bleeding, and this can be the first indication of incompatible blood transfusion during operation.

Management

The following guidelines may be helpful.

- Mild pyrexia with no other symptoms or signs:
  - leave the blood transfusion running
  - watch for any deterioration in the routine observations
  - reassure the patient.
- Pyrexia with an itchy urticarial rash, no other abnormalities:
  - slow the transfusion down
  - the itching and rash may be relieved by antihistamine drugs. Chlorpheniramine (10 mg i.m.) can be used. If patients have a past history of repeated urticarial reactions to blood they may be started on chlorpheniramine (4 mg orally 8-hourly) before transfusion
  - if the rash persists, remove the unit of blood.
- Patients with more serious symptoms that suggest either a haemolytic reaction or anaphylactic shock:

- take the blood and the giving set down. Send it with a fresh sample of the patient's blood and urine to the laboratory for analysis
- hydrocortisone (200 mg i.v.)
- adrenaline (1 : 1000: 0.5–1.0 mL i.m.)
- oxygen (mask with reservoir bag)
- watch the pulse, blood pressure, clotting time and urine output very carefully and treat accordingly with i.v. fluid.

Overall, if you are in doubt, change the blood being transfused.

Myocardial infarction

Myocardial infarction may occur after operation. People who have a past history of infarction or angina are particularly at risk, as are those undergoing vascular surgery.

Recognizing the pattern

The history is of central crushing chest pain which may radiate down the arms or into the neck. Note that in diabetics it can be pain free (silent MI).

Usually the patient is pale, cold, clammy and tachycardic. Postoperative infarction may be silent, or simply present as an unexplained hypotensive episode.

Proving the diagnosis

The ECG shows:

- ST elevation
- T-wave inversion
- Q waves.

Cardiac enzymes are elevated over the next few hours. Troponin I needs to be checked immediately and repeated 12 h later.

Management

Initial management is analgesia with diamorphine, aspirin, nitrates, oxygen and bed rest. An urgent cardiology/medical review is required. Although thrombolysis is contraindicated after major surgery, reperfusion by emergency angioplasty is increasingly available.

Left ventricular failure

Left ventricular failure occurs in surgical patients who have been overloaded with fluid, particularly where there is a past history of heart failure or myocardial ischaemia. When the left ventricle fails the lungs become oedematous and the patient dyspnoeic.

Recognizing the pattern

The patient, who is often elderly, complains of shortness of breath. This may come on acutely or slowly, and is worse on lying flat. Urine output may be poor.

On examination the patient is dyspnoeic, often very distressed and cyanosed. There is a tachycardia with a triple rhythm, and bilateral fine basal crepitations with or without bronchospasm in the lungs. In the absence of chronic obstructive airways disease, acute bronchospasm in the elderly is often due to pulmonary oedema.

There may also be associated signs of right heart failure, such as a raised JVP, hepatomegaly and peripheral oedema.

Proving the diagnosis

A chest X-ray shows hilar congestion. An ECG must be performed. In severe cases blood gas measurements are helpful.

Management

Sit the patient up and give oxygen. Intravenous diuretics (e.g. frusemide 80–120 mg) and diamorphine (5–10 mg i.v.) are effective in the acute attack. Ask for a cardiology/medical opinion.

Preventative measures are important. The elderly need less fluid (sometimes with the aid of CVP monitoring) and this must be remembered during the administration of intravenous fluid therapy (see section 2.1). Blood transfusion should be undertaken with caution. At night the patient should be propped up in bed.

Stroke

A stroke is due to intracerebral haemorrhage, thrombosis or embolism with subsequent ischaemia or infarction of cerebral

tissue. Preoperative predisposing factors include hypertension and vascular disease. During or after operation severe hypovolaemia may result in intracerebral thrombosis. Emboli may arise from the myocardium, heart valves, great vessels, or carotid and basilar arteries.

Recognizing the pattern

The patient usually suffers a sudden collapse and becomes unconscious.

On examination there may be neurological signs of hemiplegia (e.g. paralysis on one side, upgoing plantar responses, difficulties with speech). There may also be evidence of raised intracranial pressure such as a progressively slowing pulse, rising blood pressure and the appearance of papilloedema and pupil dilatation.

Proving the diagnosis

This is usually made obvious by the neurological deficit. CT scan will show intracerebral haemorrhage, and after 12 h any cerebral infarct.

Management

- If a CT scan shows a large haemorrhage with brain shift and compression, a neurosurgical opinion is sought. Acute craniotomy and decompression is only done as a last resort.
- Normally the initial management is conservative, comprising nursing care, catheterization, attention to fluid balance and regular observations.
- Treat any excessive hypertension with care, as a sudden massive fall in blood pressure to normal levels can sometimes result in a cerebrovascular event.
- The patient may be referred acutely to the neurologists for further management. They may decide to treat raised intracranial pressure.
- Most patients who have had a stroke have long-term problems and are going to be dependent on others for some time. A team consisting of occupational therapist, physiotherapist, social worker and physician for the elderly will be available to help with ongoing issues of mobilization, rehabilitation and placement.

Deep venous thrombosis

Virchow's triad describes three predisposing factors for thrombosis:

- increased coagulability of the blood
- decreased flow in the vessel
- local injury to the intima.

Once a localized thrombus has formed in a vein it may extend proximally and there is a danger that fragments of the clot will break off as emboli.

Thromboembolism is common after any surgical procedure since the criteria of the triad are all likely to be fulfilled. There is an increase in blood viscosity after an operation, associated with dehydration and alteration in the serum proteins. The patient is immobile and there may be local injury to vessels while lying on the operating table or during abdominal and pelvic surgery. In addition, there is an increase in blood coagulability following the physiological response to trauma.

The risks are particularly increased by long operations in the pelvic or hip regions. Other risk factors include a past history of deep venous thrombosis or pulmonary embolus, obesity, smoking, carcinomatosis, congenital predispositions and taking the contraceptive pill.

Common sites of postoperative phlebothrombosis are in the pelvis and in the venous plexus in the soleal muscles of the calf.

Recognizing the pattern

A characteristic sign of venous thrombosis is a persistent tachycardia and a mild 'rumbling' fever. Other signs depend on the site of the thrombus formation.

- Pelvic phlebothrombosis is difficult to diagnose. Apart from the systemic signs, there is little to find.
- Acute thrombosis of the iliac veins or femoral veins leads to a grossly swollen painful leg. There is localized tenderness over the involved vein.
- Axillary vein thrombosis similarly presents with a marked swelling of the arm.

- When thrombosis occurs in the soleal plexus there is tenderness in the soleal muscle, which is swollen and turgid compared with the other side. The enlargement can be measured accurately with a tape measure.

Proving the diagnosis

D-dimers are degradation products from fibrin mesh and are produced during the organization of a thrombus. They will therefore be elevated. However, this is non-specific after surgery.

The best non-invasive investigation is a duplex scan of the femoral veins. Although iliac and calf veins are difficult to see, isolated calf venous thrombosis is unlikely to lead to massive embolization and a normal femoral vein usually excludes iliac vein disease.

A venogram is performed:

- where duplex is not available
- to detect clot in the iliac venous segments or inferior vena cava
- for placement of a caval filter.

Management

PREVENTION

Identify any patient who is at risk (see above). During the operation avoid prolonged calf compression (rest the heels on a pad to elevate the calves; do not lean on the calves). It is also possible to aid venous return by compression stockings or intermittent calf compression with inflatable stockings. Subcutaneous low molecular weight heparin should be given to 'at-risk' patients (5000 units subcutaneously 8-hourly). The timing of the first dose may be influenced by the type of anaesthetic, particularly if an epidural catheter is to be inserted. Be sure you are familiar with local policy. Prophylaxis should be continued until the patient is fully mobile. Passive leg exercises should be encouraged whilst the patient is in bed, and the foot of the bed should be elevated to increase the venous return. Early mobilization should be the rule for all surgical patients.

In certain procedures the surgeon may not wish to give subcutaneous heparin because of the risk of bleeding and you should always check with him or her before starting therapy.

TREATMENT

If deep venous thrombosis is proven, full anticoagulation with intravenous heparin is the treatment of choice, followed by oral warfarinization.

Compression stockings, analgesia and mobilization when comfortable, are important factors in treatment.

Pulmonary embolus

Pulmonary embolism occurs when a thrombus from the peripheral venous system becomes detached, passes through the right side of the heart, and impacts in the pulmonary arterial circulation. The consequences depend on the size of the embolus and the site at which it lodges.

A small embolus causes a localized pulmonary infarction and pleurisy if the periphery of the lung is involved (Fig. 1.7.1a). Small emboli may herald larger ones; repeated small emboli can cause pulmonary hypertension.

A large embolus blocks the main pulmonary arteries and thus causes a major block to the whole circulation. The effects are shown in Fig. 1.7.1(b). There is decreased output from the left ventricle and a rise in venous pressure.

Emboli imply the presence of deep venous thrombosis. In 50% of cases the site of the primary problem is not obvious.

Recognizing the pattern

A small embolus may cause pleuritic chest pain, haemoptysis and difficulty in breathing due to pain. However, it is often silent. A large embolus may cause collapse with cardiac ischaemic pain due to poor cardiac output. It is one of the common causes of sudden death postoperatively.

Usually there are no chest signs. The patient is almost always tachycardic. A life-threatening pulmonary embolism will give signs of a gallop rhythm, hypotension and right ventricular strain (e.g. raised JVP).

Proving the diagnosis

This is difficult and one must have a high index of suspicion.

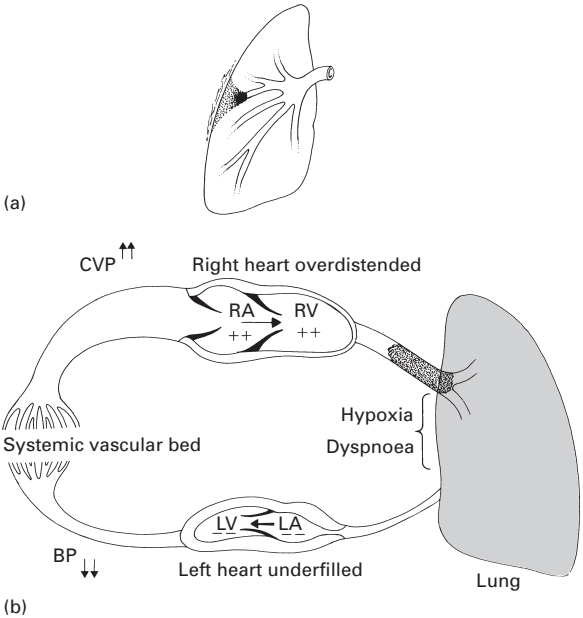


Fig. 1.7.1 (a) A minor embolus produces a pulmonary infarct. (b) A major pulmonary embolus affects the whole circulation. CVP, central venous pressure; BP, blood pressure; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

- Arterial blood gases.
  - There will be a lowered PO_2 due to the physiological shunt present.
  - The PCO_2 will be low due to tachypnoea.
- D-dimers are degradation products from fibrin mesh and are produced during the organization of a thrombus. They will therefore be elevated. However this is non-specific after surgery.
- The ECG usually shows tachycardia, and may show an S wave in lead 1, a Q wave in lead 3 and an inverted T wave in lead 3 in the presence of right heart strain (S1, Q3, T3).

- A chest X-ray is usually normal. Subtle signs may be present such as paucity of lung markings on the affected side, or a wedge-shaped opacity in the presence of pulmonary infarction.
- Ventilation perfusion scans show areas of defects in perfusion which are not associated with defects of ventilation (V/Q mismatch). The scans report a probability that there has been an embolus. This ranges from low, to moderate, to high probability.
- Emergency CT angiography is the gold standard examination. This will show the presence of the clots in the major pulmonary arteries, confirming the diagnosis.

Management

RESUSCITATION

A large embolus can cause acute circulatory collapse and cardiac arrest. The patient may require intubating and ventilating with oxygen. An intravenous cannula should be inserted to provide a route for drugs. If the patient has a cardiac arrest, efficient heart massage may break up the clot and push it further into the pulmonary tree, thus allowing some circulation to be restored. Immediate embolectomy may be appropriate. This is discussed further below.

ANALGESIA

Non-steroidal analgesia is effective in pulmonary embolism. It may be dangerous to give any other analgesia because of the risk of exacerbating the hypotension.

ANTICOAGULATION

The patient is heparinized and anticoagulated as on p. 105. If the patient does not improve and cardiac failure persists, further measures to remove the clot are indicated. This may be attempted using thrombolytic agents or by open pulmonary artery embolectomy.

- Thrombolytic agents.
  - Many emboli can be dissolved by agents such as streptokinase, urokinase or tissue plasminogen activator. Thrombolytics may be given by direct infusion into the pulmonary artery or into the systemic circulation through a peripheral vein. They break up the embolus by activating plasminogen.

- Thrombolytic therapy is dangerous in patients who are:
  - within 5 days of a major operation
  - within 10 days of a hip replacement
  - within 4 weeks of a diagnostic cannulation of a major artery
  - hypertensive
  - pregnant, within 10 days of delivery or lactating
  - in hepatic or renal failure
  - actively bleeding from the bowel or urinary tract.

  These patients may be treated by pulmonary embolectomy, but the relative risks will have to be weighed up on an individual basis.

- Pulmonary artery embolectomy. Massive pulmonary emboli can be removed surgically as an emergency. This is only indicated when the patient fails to respond to anticoagulation or thrombolytic therapy, when there is insufficient time to allow thrombolysis to work because of the patient's desperate condition, or when thrombolytic therapy is considered to be too dangerous.

  The operation may be done in one of two ways.

OPERATION: INFLOW STASIS PULMONARY EMBOLECTOMY

This operation is performed if there are no facilities for cardiopulmonary bypass. The superior and inferior vena cava are exposed through a midline sternotomy and controlled with tapes. The pulmonary artery is opened and the clot sucked out. The venous inflow can be restored and interrupted several times in order to remove all the emboli.

Procedure profile

Blood requirement	10
Anaesthetic	GA
Operation time	1–2 hours
Hospital stay	Variable
Return to normal activity	2–3 months

OPERATION: CARDIOPULMONARY BYPASS
This is the safest way to remove major emboli surgically. The sternum is split and the right atrium and aorta cannulated. After cardiopulmonary bypass has been established the pulmonary artery is opened and all clot removed.

Procedure profile

Blood requirement	10
Anaesthetic	GA
Operation time	1–2 hours
Hospital stay	Variable
Return to normal activity	2–3 months

1.8 Urinary complications

Urinary tract infection

Urinary tract infection is a common complication in the post-operative period. Urinary catheterization is an important predisposing factor, although it can occur following any episode of hypovolaemia, with decreased renal perfusion, low urinary output and urinary stasis. The organism is commonly a Gram-negative bacillus such as *Escherichia coli*. Risk factors for the development of urinary tract infections in the non-hospitalized population include:

- anatomical abnormalities leading to urinary stasis or urinary reflux into the upper tracts (ureter and kidney)
- bladder outflow obstruction with consequent residual urine
- stones
- bladder diverticulum
- bladder carcinoma
- pregnancy
- diabetes mellitus.

Recognizing the pattern

Women are more frequently affected than men. The patient complains of frequency and urgency of micturition, and burning dysuria. She is usually pyrexial and this may be the first sign if a catheter is in place. Other symptoms include suprapubic pain and pain in the renal angle due to ascending infection. Advanced infection can result in septicaemia and rigors. The urine looks cloudy and may smell offensive. There may be haematuria.

Proving the diagnosis

The white cell count is elevated with a neutrophil leucocytosis. Urinalysis shows the presence of blood, leukocytes and nitrites. Microscopic examination of a specimen of urine shows white cells and protein casts. The causative organism may be cultured.

Management

The patient is encouraged to drink up to 4 L/day. Antibiotics are commenced once the bacteriological specimen has been taken. The choice of drug is discussed on p. 104. Any indwelling catheter should be removed if this is feasible.

Further investigations, such as an ultrasound scan (USS), CT scan with contrast (CT KUB) and cystoscopy, are indicated if the infection does not settle or recurs.

Postoperative retention of urine

This is a common postoperative problem and the most frequent cause of oliguria following surgery. The patient finds it difficult to initiate micturition while under the influence of drugs, in strange surroundings, when movements are painful and when they are immobilized in bed. Benign prostatic hypertrophy is an important predisposing cause, although postoperative urinary retention also occurs in women. Patients at risk should be recognized during the initial clerking. Other causes of acute retention are mentioned on p. 452.

Recognizing the pattern

The patient in classical acute retention is anuric and in great discomfort with an intense desire to micturate. The bladder is palpable as a tender mass arising out of the pelvis.

This classic picture is not, however, always present and the condition can be difficult to diagnose.

- Elderly patients, in particular, may develop acute confusion, without other symptoms indicative of acute urinary retention.
- The patient may not be anuric. In acute retention with overflow the patient produces urine but the amounts are small (50–100 mL) and passed very frequently. This pattern, recorded on the fluid chart, should alert you to the possible diagnosis.
- An abdominal incision covered with dressings may make it impossible to palpate the enlarged bladder and thus obscure the cause of pain. Suprapubic dullness to percussion can be a useful sign in these circumstances.
- Patients with chronic retention have a distended bladder and frequency, but may have no discomfort.

Proving the diagnosis

The diagnosis is proved by passing a urethral catheter and releasing a large volume of urine (more than 500 mL in an adult). Very occasionally an ultrasound examination can be helpful to define the enlarged bladder.

Management

Patients at risk should not be subjected to continual questions about whether they have passed urine or not. Privacy, reassurance and adequate analgesia are helpful. If retention is developing, a tranquillizer (such as diazepam 5–10 mg i.m.) can be useful and conservative measures, such as sitting in a hot bath, and allowing the patient to sit out on the toilet, should be tried.

There are two indications for catheterization:

- the patient is in pain from the distended bladder and demands relief
- there is doubt about the diagnosis and renal failure must be excluded.

In other circumstances it is always worth waiting for the patient to pass urine naturally.

The method of passing a urethral or suprapubic catheter is described on p. 453. If there is very little urine in the bladder and adequate amounts are not produced after catheterization, the patient may be in renal failure and should be managed accordingly (see below).

Patients who have been in retention should have the catheter removed after 24–48 h. In elderly males, if two trials of catheter removal are unsuccessful, the patient should be considered for a prostatectomy (p. 455).

Postoperative renal failure

Failure to produce urine after an operation, once obstruction has been excluded, may be due to prerenal failure or acute renal failure (Fig. 1.8.1).

Prerenal failure

The blood supply to the kidneys may become inadequate postoperatively due to dehydration, blood loss or systemic hypotension. These causes are reversible, but if they are not dealt with early the condition may progress to acute renal failure.

Recognizing the pattern

The minimum adequate urine output in the postoperative period is generally accepted to be 0.5 mL/kg/h (about 30 mL/h for a 70-kg man). Having established that the urine output is inadequate, if necessary by insertion of a catheter, the diagnosis of prerenal failure is made by finding concentrated urine and signs of a cause, and excluding acute renal failure.

- Examine the patient, looking for hypotension, dehydration (dry tongue, poor skin turgor) or cardiac failure (JVP, CVP). Assess the peripheral perfusion (warm or cold hands?).
- Inspect the charts, looking for a negative fluid balance, and check whether there has been any excess blood loss or a period of hypotension.
- Check the renal function and measure the urine specific gravity. In prerenal failure, the plasma creatinine should be normal, but the serum urea may be high, indicating

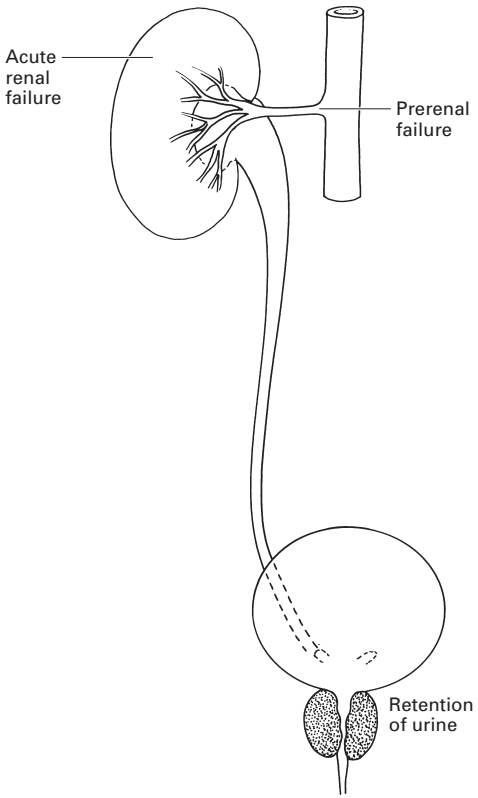


Fig. 1.8.1 Causes of oliguria/anuria.

dehydration. The urine will be very concentrated (specific gravity over 1020).

Management

Administer crystalloid or colloid fluids, or blood, intravenously, in order to restore urine output. In the elderly or those with haemodynamic instability it is wise to monitor the CVP via a central line (p. 93), aiming to get it to the upper limit of normal.

If the urine output remains poor, urine production can be stimulated by the use of an intravenous low-dose dopamine infusion (2–5 μg/kg/min) or an intravenous bolus of frusemide (20–40 mg).

Acute renal failure

In a surgical patient this usually follows a period of renal hypoperfusion (prerenal failure) as above. It can also be a complication of incompatible blood transfusion, extensive trauma or drug therapy. The condition is associated with acute necrosis of the renal tubules (acute tubular necrosis).

Proving the diagnosis

The diagnosis is made after catheterization has excluded retention, and careful fluid status assessment and correction have excluded renal hypoperfusion. If the urine output remains less than 0.5 mL/kg/h, acute tubular necrosis has occurred. This should be confirmed by finding a rising plasma urea and creatinine concentration. A urine specimen should be sent for biochemical analysis. Typical findings are low urine sodium, potassium and urea concentrations and a low osmolarity.

Management

- Insert a central line to assist with the careful management of the patient's fluid status. Aim to keep the CVP at the upper limit of normal, avoiding fluid overload.
- Administer an intravenous infusion of low-dose dopamine or an intravenous bolus of frusemide as this may restart urine production.
- Treat hyperkalaemia. If the plasma potassium concentration is dangerously high ($K^+ > 7.0$ mmol/L) administer calcium gluconate (10 mL of 10%) intravenously while monitoring the ECG. Administer an intravenous bolus of 50 mL 50% dextrose with 16 units of insulin and commence an intravenous dextrose/insulin infusion. Plasma potassium concentrations may also be reduced by administration of an enteral potassium chelating agent (e.g. calcium resonium 15 mg q.d.s. orally or rectally).
- The further management of established renal failure is complex and best described in medical textbooks. It includes:

- restricted fluid intake: 500 mL/day plus any fluid losses
- restricted protein intake (less than 20 g/day)
- adequate carbohydrate intake (3000 kcal/day)
- daily assessment of blood and urinary electrolytes and adjustment of electrolyte intake accordingly. Sodium losses are replaced but potassium is not given
- peritoneal dialysis or haemodialysis if necessary. Peritoneal dialysis can be used in a patient who has had laparotomy from about 4 or 5 days after the wound has been closed. Continuous haemofiltration is preferred in the intensively ill patient.

Urinary fistula

This follows either breakdown of a urinary tract anastomosis or accidental damage to the ureters during operation.

Recognizing the pattern

The condition presents with an increased discharge through the wound or drain site. This has a characteristic appearance and smell of urine. There is less constitutional upset than with an intestinal fistula.

Proving the diagnosis

The urea content of the fluid is high (like urine) and above the level of the patient's serum urea. If further proof is necessary it can be obtained by giving an intravenous injection of indigo carmine, which is excreted by the kidney and will appear through the fistula.

Management

A urinary fistula will close spontaneously (like bowel fistula, p. 74) providing there is no distal obstruction. Such closure may take several weeks. The presence or absence of distal obstruction can be ascertained by performing a 'fistulogram'.

If the fistula fails to heal, operation is needed and the precise nature of this depends on the site of the fistula. Free distal urine drainage must always, however, be established.

Urinoma

This occurs for the same reasons as a urinary fistula, but does not drain spontaneously. An intra-abdominal collection of urine develops. This may become infected.

Recognizing the pattern
The condition presents with abdominal discomfort due to pressure and local inflammation. The patient may have a fever and a mass may be palpable.

Proving the diagnosis
The presence of a fluid collection is best demonstrated using ultrasound or a CT scan, which will have a characteristic appearance. The diagnosis is confirmed by demonstrating urine on aspiration (see below).

Management
A suspected urinoma should be drained percutaneously, under ultrasound or CT guidance. Distal obstruction should be excluded by performing an IVU.

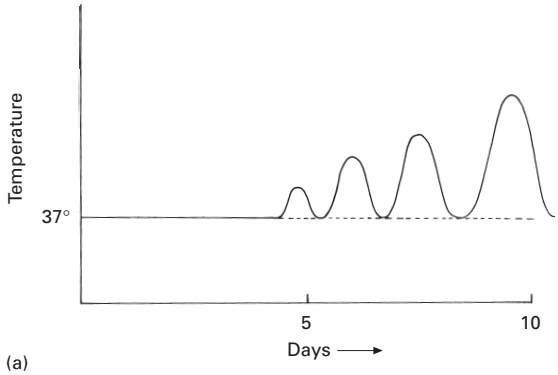
1.9 Infections, abscesses and fistulae

Wound infection

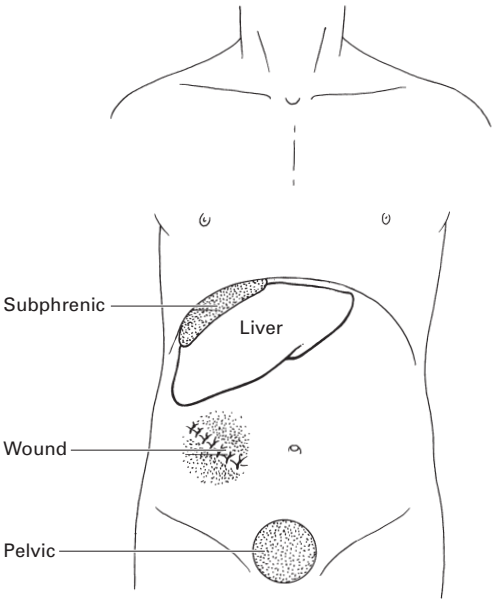
Infection complicates between 1 and 40% of surgical incisions, depending on the type of procedure being performed (Fig. 1.9.1). A wide variety of organisms may be involved.

Predisposing factors

- Preoperative:
  - malnutrition
  - diabetes
  - carcinomatosis
  - infection near the site of incision
  - immunosuppressive therapy.



(a)



(b)

Fig. 1.9.1 (a) Postoperative sepsis. (b) Sites of postoperative abdominal sepsis.

- Operative:
  - the incidence of wound infection depends on the amount of operative contamination:
    - clean wounds: 1%
    - slight contamination: 1–5%
    - clear contamination: 5–30%
    - dirty wounds (e.g. faecal peritonitis): > 30%
  - infection from staff, instruments or air-borne agents
  - poor surgical technique, e.g. haematoma formation, devitalized tissue in wound or closure under tension
  - poor blood supply.
- Postoperative: infection on the ward (from either the patient themself, other patients or staff).

Recognizing the pattern

There is a history of increasing pain and tenderness in the wound.

On examination the patient has a climbing, swinging pyrexia with localized tenderness in the wound, which is also swollen, hot and red. There may be fluctuation on palpation or pus may discharge.

Proving the diagnosis

- White cell count. This will be elevated in active infection.
- A specimen of pus must be sent to microbiology for culture.

Management

- The collection should be drained. Remove some of the stitches and probe the wound to let out all the pus. Sometimes an anaesthetic is required to achieve adequate drainage.
- The wound is dressed daily, or more frequently if dressings become saturated. The wound is not resutured but left to heal by secondary intention.
- Analgesia.
- Antibiotics should be started on clinical grounds if the patient has systemic upset or cellulitis and changed later according to microbiology advice.

Wound dehiscence

Breakdown of the wound may be either partial or complete (Fig. 1.9.2). In partial breakdown the skin closure holds, but breakdown of the muscle layers gives rise to an incisional hernia later. In complete dehiscence the abdominal incision bursts open to reveal bowel. The aetiology is similar to that for wound infection. Exacerbating factors include:

- obesity
- raised intra-abdominal pressure (from coughing, difficulty in passing urine or constipation)
- ascites draining through the wound

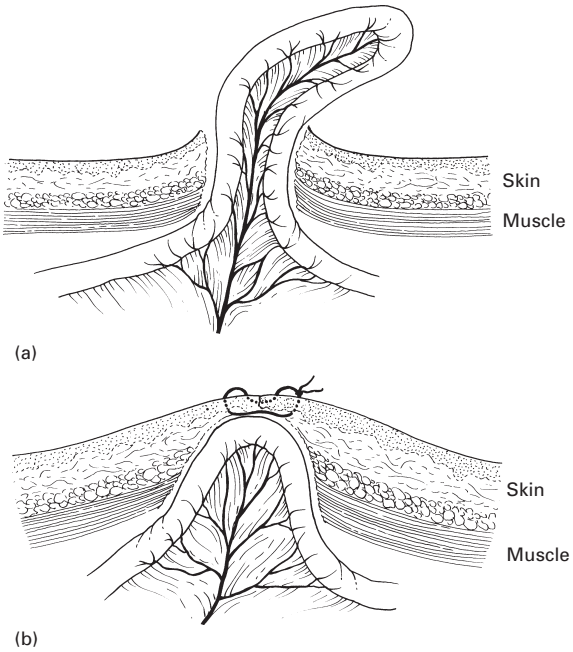


Fig. 1.9.2 (a) Complete wound dehiscence. (b) Incomplete (partial) wound dehiscence.

- wound infection
- haematoma.

However, wound dehiscence is largely due to faulty technique. Factors include pulling the sutures too tight, inserting sutures too close to the edge of the muscle, and insecure knots. Wound dehiscence is much less common since one-layer, mass closure, monofilament suture techniques have been used.

Recognizing the pattern

This occurs typically 4–10 days after operation. The patient may feel something 'give' in the wound. There is a sudden increase in pain and a pink fluid discharge from the wound. In complete dehiscence there is protrusion of loops of bowel. The patient becomes shocked and distressed.

Management

- Lie the patient down and give reassurance.
- Strong opiate analgesia is required.
- Cover the wound with a sterile pack soaked in warm saline.
- The wound requires urgent resuture in theatre with deep-tension sutures.

OPERATION: RESUTURE OF ABDOMINAL WOUND

The dressings and sutures are removed and the whole wound is reopened. All the muscle layer sutures are taken out. A laparotomy is performed and any intraperitoneal pus is removed. Bacteriological specimens are collected for aerobic and anaerobic culture. The decision whether to reclose the fascia of the abdominal wall depends upon the cause of breakdown. Resuture of the skin is generally inadvisable unless dehiscence was related solely to a technical error in fascial closure at the first operation.

Procedure profile

Blood requirement	0
Anaesthetic	GA
Operation time	1 hour
Hospital stay	2 weeks or more
Return to normal activity	6 weeks

The wound tends to discharge and may require regular dressing. Antibiotics should be started at the operation and continued as long as necessary. They can be modified according to the results of the culture.

Infected intravenous drip site

A drip site may become infected and is one of the causes of postoperative pyrexia. The organism is often staphylococcus. Spreading cellulitis suggests streptococcus.

Recognizing the pattern
The patient complains of pain in the limb that is being infused. The intravenous infusion usually slows or stops completely. The patient is pyrexial and the involved skin is red, swollen and tender. There may be spreading cellulitis over the vein proximally, and even pus around the entry of the cannula. Regional lymph nodes may become enlarged, tender and inflamed.

Management
The cannula must be removed and the tip cultured. If the infusion is still required, resite the drip in the other arm. Antibiotics are given following hospital protocol. Systemic analgesia is often needed and a poultice applied to the inflamed vein is comforting.

Subphrenic abscess

A subphrenic abscess may follow generalized peritonitis, particularly after acute appendicitis or a perforated peptic ulcer. It may also occur through infection of a haematoma after an operation such as splenectomy. Such abscesses are commonly just underneath the hemidiaphragm but may also occur beneath the liver in the lesser sac or in the hepatorenal pouch.

Recognizing the pattern
The patient initially recovers from the operation and then 7–21 days later develops a swinging fever and general malaise, nausea

and loss of weight. They may complain of pain in the upper abdomen which can radiate to the shoulder tip. They may also become breathless due to a pleural effusion above the abscess or collapse of the lower lobe of one lung.

On examination there is a swinging pyrexia for which no obvious cause is found. Occasionally, there may be tenderness or even oedema in the abdominal wall in the subcostal region. The liver may be displaced downwards and there may be physical signs of a pleural effusion or collapse of the lung.

Proving the diagnosis

The old aphorism 'pus somewhere, pus nowhere else, pus under the diaphragm' is a useful reminder of the possibility of a subphrenic abscess. The presenting symptoms and signs do not always suggest this possibility. A CT scan will reveal it.

Management

A small abscess containing thin pus may be amenable to guided aspiration and broad-spectrum antibiotics based on likely aetiology. For most patients though, the best management is CT- or ultrasound-guided percutaneous drainage. If the patient remains toxic and ill for more than 3 days, repeat scanning may reveal an undrained loculus and this may necessitate a second drain or the use of a surgical approach to achieve proper drainage.

Operation is rarely required nowadays.

OPERATION: DRAINAGE OF SUBPHRENIC ABSCESS

The abscess may be approached by a posterior or anterior route.

- Posterior approach: the patient is positioned lying on their side with the abscess uppermost. The 12th rib is removed and the subhepatic space or subphrenic space approached retroperitoneally. When the abscess is encountered it is opened and drained in the most dependent direction.
- Anterior approach: the abdomen is opened through a subcostal incision and the abscess approached extraperitoneally and drained.

Once the abscess has been opened, covering antibiotics can be given, although they are not essential. Large abscess cavities are usually drained using a large silicone tube to encourage track formation.

Procedure profile

Blood requirement	0
Anaesthetic	GA
Operation time	1 hour
Hospital stay	1–2 weeks
Return to normal activity	4 weeks

Postoperatively, if the abscess is large, a sinogram may be performed down the drain after 10 days and the progress of the cavity followed. The drain can then be gradually withdrawn as the abscess heals up behind it.

Hepatic abscess

This often occurs as metastatic infection from intraperitoneal sepsis, usually in a debilitated patient. The abscess may be single or multiple. The incidence is low since antibiotic treatment was introduced. The more common causes of hepatic abscesses include appendicitis, diverticular disease, ulcerative colitis and ascending cholangitis.

Recognizing the pattern

The patient is usually very ill with a high swinging fever and rigors. They may complain of right upper quadrant pain and develop mild jaundice. The liver may be enlarged and tender.

Proving the diagnosis

- The white cell count is raised.
- Liver function tests are abnormal. In particular the alanine transaminase (ALT) is raised.
- The abscess cavity may be demonstrated on ultrasound or CT scan.
- An erect chest X-ray shows a high right diaphragm and fluid in the pleura above it.
- Blood cultures may occasionally be positive.

Management

The patient should be given broad-spectrum antibiotics and the abscess aspirated or drained as soon as it is localized. Ideally this is done percutaneously under ultrasound or CT guidance. The same principles that apply to subphrenic colllections also apply here, although open operation is even more of a rarity.

OPERATION: DRAINAGE OF HEPATIC ABSCESS

The abscess is usually approached through an extrahepatic route over the right lobe of the liver. As the abscess is approached, oedema and fibrosis are encountered and this may be broken into, opening up the cavity in the liver. A drain is inserted.

Procedure profile

Blood requirement	2–4
Anaesthetic	GA
Operation time	1 hour
Hospital stay	14–21 days
Return to normal activity	6–12 weeks

The postoperative care is similar to that described above for a subphrenic abscess.

Pelvic abscess

This is an abscess in the rectovesical pouch commonly following peritonitis, e.g. after a pelvic appendicitis or colonic perforation. Infection of a pelvic haematoma following poor haemostasis is another common cause.

Recognizing the pattern

A patient who has had generalized peritonitis becomes unwell with pyrexia and malaise 4–10 days postoperatively. There may be a history of mucus discharged per rectum. The abscess may rupture through the rectum or vagina.

On examination the patient has a swinging pyrexia, and rectal or vaginal examination may reveal a palpable mass which may be pointing and may indeed burst on examination.

Management

Daily rectal examinations should be performed to monitor the progress of the developing abscess. The abscess may point up into the wound or down into the rectum. When a fluctuant area is felt in the rectum it can be broken into with a finger under a short general anaesthetic. If the patient has systemic symptoms antibiotics may be given but these delay the ripening and discharge of the abscess. Premature attempts to drain the abscess through the rectum may damage adjacent loops of bowel, leading to fistula formation. An alternative route for drainage in women is through the posterior fornix of the vagina.

External intestinal fistula

This is a communication between the bowel lumen and the body surface. It develops postoperatively due to the following factors.

- Disruption of a bowel anastomosis (due to tension, ischaemia, infection or distal obstruction).
- Inclusion of the bowel when suturing the abdominal wall.
- Erosion of the bowel by an abdominal drain.
- Perforation of ischaemic bowel (e.g. due to damage to the mesentery at operation or after strangulation in a hernia).

Recognizing the pattern

Five to 10 days after operation there is an increased discharge through the wound or down a drain which becomes faecal and offensive. Persistent discharge causes general malaise, dehydration, hypoproteinaemia and weight loss. If the track is not completely walled off generalized peritonitis may occur.

Proving the diagnosis

The presence of a fistula can be demonstrated by radiological studies involving the use of water-soluble contrast.

Management

Fistulae tend to heal spontaneously providing there is no distal obstruction and the patient receives adequate nutrition. Healing usually takes 3–6 weeks. A fistula will not heal where:

- the tract becomes epithelialized
- there is obstruction beyond the fistula site
- there is persistent infection (e.g. tuberculosis, a foreign body, Crohn's disease, actinomycosis or an abscess in the fistula tract)
- there is malignant disease along the tract.

In the absence of these problems, conservative management should be followed.

- Protect the skin from autodigestion (especially with a high intestinal or pancreatic fistula). This can be achieved by covering the surrounding skin with stomahesive and attaching an ileostomy bag to the fistulous opening.
- Parenteral nutrition. This has transformed the management of intestinal fistulae. When a fistula is diagnosed a central venous access line should be set up in almost all instances. It is peferable to dedicate this line to nutrition only. Oral feeding can then be restricted and the patient's nutritional state maintained until the fistula heals (see p. 91). When a fistula occurs that involves stomach or proximal small bowel, distal jejunostomy feeding may be possible , but care should be taken as fluid and electrolyte losses can be prodigious.
- Adequate fluid and electrolyte replacement of the volume lost down the fistulous track must be given. Daily electrolyte estimations should be performed.
- Octratide, a synthetic somatostatin analogue, may be used to convert a high-output fistula (> 400 mL/day) to a low-output fistula (< 400 mL/day). This makes fluid management much easier and may reduce the time to spontaneous closure.

Surgical closure may be required if the fistula fails to close off with the above conservative treatment. In that case it will be necessary to excise the fistulous track and deal with any cause of failure to heal.

OPERATION: EXCISION OF FISTULA

The skin is incised around the external opening and the track dissected out and removed. Any obstructive lesion must be dealt

with. The defect in the bowel is oversewn and the abdominal wall closed. In the presence of persistent sepsis, it may be safer to bring out the bowel opening as an ileostomy (to be closed later). A repair of a large bowel fistula may need covering with a proximal colostomy.

Procedure profile

Blood requirement	2
Anaesthetic	GA
Operation time	1–2 hours
Hospital stay	10–14 days
Return to normal activity	4–6 weeks

Bed sores

Bed sores occur over pressure areas in patients who are immobilized in bed for a long period. Five factors play a part:
- pressure
- moisture
- anaemia
- malnutrition
- injury.

Making the diagnosis
The area initially becomes erythematous and does not blanch on pressure. The skin then ulcerates and may become secondarily infected.

Management
Bed sores are avoided by good nursing care with regular attention to pressure areas and regular turning in bed. The patient should not be allowed to lie on damp sheets. Sheepskin pads under the heels and sacrum help. Patients who are going to be immobilized for a long period of time should be nursed on a water bed or ripple mattress.

For established bed sores, avoid pressure on the area. Regular gentle massage to the surrounding skin is necessary. Infrared therapy may help. Keep the area dry either with dressings or by leaving the wound open to the air. Antibiotics are required if there is spreading cellulitis or systemic illness and the patient must be mobilized as soon as possible.

Extensive chronic bed sores may require excision and rotational skin grafting.

Septicaemia

This is an overwhelming infection spreading from the primary source into the bloodstream. Gram-negative organisms, staphylococci or streptococci are common culprits relating to infections in the biliary and urinary systems. Fungal septicaemia should not be overlooked in the patient who has already received antibiotics or is immunocompromised.

Recognizing the pattern

The patient is collapsed with a pyrexia (39–40°C), a tachycardia and a normal or low blood pressure. The extremities are initially warm due to vasodilatation, but may later become cold due to hypoperfusion. The patient may have rigors.

Look for a cause. Inspect the urine: is it cloudy and thick? Examine the chest and abdomen: is there a CVP line that may be infected?

Proving the diagnosis

- Blood cultures.
- Other microbiology samples should be sent depending on the suspected site of infection.
- If there is a CVP line in use and it is suspected that this is the source of the infection, it should be removed and the tip cultured. Resite it if required.
- White cell count.

Management

- Intravenous antibiotics must be started immediately after the blood cultures have been taken. The choice depends on the

sort of surgery that has been undertaken and should be chosen according to the hospital protocol or in discussion with the microbiology team.
- Intravenous support of the circulation. In severe cases a CVP line is used to monitor this.
- Watch the urine output. The patient should be catheterized.
- It is well worth while discussing the case with the microbiologists, particularly if the origin of the organism found is not known.
- Treat the cause of the septicaemia as required.

1.10 Laparoscopic and endoscopic surgery

The modern junior surgical trainee requires a working knowledge of minimal access (laparoscopic, thoracoscopic) techniques in order to explain them to patients, relatives and other health workers, and to assist in the care of patients undergoing the procedures.

GENERAL POINTS ABOUT LAPAROSCOPIC SURGERY

Because the operation is carried out through small incisions (usually less than 1 cm in diameter) there is much less trauma to the body wall. This is associated with less pain, less analgesic requirements and a more rapid recovery. There is also less scarring so the cosmetic result is superior. Patients usually enjoy a more rapid discharge from hospital. This may mean that complications then develop at home and may therefore be more difficult to diagnose, especially as such complications are rare. Before the operation the patient will need a clear explanation of what is intended. It can be very difficult for a patient to understand the gravity of their operation when they see very small scars on the skin afterwards.

TECHNIQUES

Endoscopic surgery relies on viewing the inside of the body using an image on a video screen. This image is used by the surgeon to perform the operation rather than looking at the body tissues directly, as in conventional surgery. A rod lens telescope is

connected to an external light source and to a camera that relays the image to a screen. Operating using an image has advantages. It can be obtained using a telescope through a very small incision, and is easy to magnify, facilitating very detailed surgery. The image can also be enhanced in various ways and other information can be fed to the video screen including images from X-ray machines and other equipment.

A disadvantage is that modern video screens only produce a two-dimensional image so the surgeon's ability to distinguish depth is diminished. Normal tactile feedback is lost, though it is still possible to 'feel' a certain amount through the shaft of the instruments.

ASSISTING AT LAPAROSCOPIC SURGERY

As a junior surgical trainee you may be required to hold and manipulate the camera. This is an important task as the surgeon can only carry out an accurate operation if he or she is given a good view. You should hold the camera steadily and avoid excessive movements. Only alter the position when an adjustment is required. Learn where the focusing mechanism is and keep the image in focus. Learn how to move the camera and telescope into the abdomen (zoom) and how to move it out again. With a zero degree lens, the position of the light lead does not matter, but with an angled lens, rotating the light lead will rotate the telescope, altering the field of view. The surgeon will use this facility in some operations.

POSTOPERATIVE CARE OF THE PATIENT

Generally speaking this is straightforward. Particular points are dealt with under the specific operations. Patients usually recover very quickly and have minimal pain. They may require analgesics which can usually be of the mild variety (paracetamol, codeine). Non-steroidal analgesics are useful for moderate pain but opiates are rarely needed. If the patient is discharged rapidly, tell them to get in touch with you if they develop increasing pain once they are home. This is unusual and should be taken seriously. It is often best to readmit them to check whether there is a serious problem.

1.11 The junior surgical trainee's role in the intensive care unit

Intensive care units are designed to look after the very ill. The unit is run by specialists in intensive care medicine and senior specialized nursing staff. So although the care of the patient is undertaken jointly with the intensivists, the ultimate responsibility for a surgical patient normally resides with the consultant surgeon. In the intensive care unit, the junior surgical trainee's role is to act as a coordinator and to monitor all aspects of patient care, making sure that nothing is left out. Although most of the management decisions are made by others, it is important to keep everybody in touch with events and to keep up to date with the patient's progress yourself.

The intensive care unit often seems very impersonal, with a large part of the management based on observation charts, results and machinery. In the midst of all this do not forget to examine the patient. Also remember that even if patients cannot speak (because they are intubated) they may well be able to see and hear all that is going on. Make sure you keep them fully informed about how they are progressing and avoid discussion or teaching within earshot.

A patient's family also need special care. They are understandably anxious and may find this environment intimidating. They must be reassured and care must be taken to explain all that is going on.