The significance of the past medical, social, and drug history in assessing emergencies and admissions

In all patients requiring admission, or an anaesthetic, a full medical, social, and drug history should eventually be taken. This will establish the diagnosis, determine the need for treatment, and assess the patient’s general health in relation to possible treatments. However, when dealing with emergency or urgent cases, often this is not possible in the early stages of assessment. This is seen particularly in the management of the multiple-injured patient. In these cases it is essential to rapidly identify those factors that may have an immediate impact on either establishing the diagnosis or managing the clinical problem. How findings relate to management is outlined below.

**Age**

Although not a medical condition, the elderly have a decreased physiological reserve and need to be closely monitored. This is particularly so following blood loss (epistaxis, multiple injuries), where prompt fluid replacement is necessary. Care is also required not to overload their cardiovascular system. Elderly patients are also often on a variety of medications, each with their potential for problems from withholding, or drug interactions.

**Pregnancy**

Ask this in all women of childbearing age. In trauma, the best treatment for the foetus is to treat the mother first. Get the obstetricians involved early. For other emergencies pregnancy may influence the choice of local anaesthesia and other medications. Certain drugs are potentially teratogenic and may affect foetal maturation (e.g. closure of ductus arteriosus) or the onset of delivery. If in doubt refer to the BNF. In reality, radiographs (and even CTs) of the face carry very little risk to the foetus, but by and large most units will restrict or minimize these to those regarded as essential.

**Ischaemic heart disease**

This increases the risks of using general anaesthesia and local anaesthesia with adrenaline. In addition, cardiac pain can occasionally present as discomfort in the neck, mandible, or even ‘toothache’. It should therefore be considered in the differential diagnosis. Pain on exertion, which is relieved by rest or GTN spray, is highly suggestive.

**Hypertension**

This increases the risks of general anaesthesia and local anaesthesia. Hypertensive ‘crises’, where the blood pressure is extremely high, can present with headaches and drowsiness, and therefore must be part of the differential diagnosis for these conditions.

**Rheumatic fever, artificial valves, and endocarditis**

Not all abscesses need antibiotics if adequately drained (e.g. dental abscess, boils). However, patients with a history of rheumatic fever, prosthetic heart valves or previous endocarditis are at risk from bacteraemia and in these cases antibiotics may be necessary.
Chronic obstructive airways disease (COAD)
Do not give oxygen over 28%. The exception to this rule is in the multiple-
injured patient with life-threatening injuries. Here the ‘lesser of two evils’
has to be chosen.

Asthma
Avoid aspirin and other NSAIDs

Diabetes
Consider a hypoglycaemic attack in all confused or aggressive head-injured
(and non-head-injured) patients, even if they appear to be intoxicated.
Diabetics are at risk of infections, which can spread rapidly (notably
dental). Occasionally a severe infection may be the presenting feature of
diabetes. All patients with facial abscesses should be screened for this.

Hepatitis
Risks of cross-infection. Check LFTs and clotting.

Epilepsy
Fitting can occur after head injuries, especially in children. In epileptics this
makes the assessment of head injuries difficult. Status epilepticus aggrava-
tes severe head injuries as a result of the fluctuations in blood pressure
and hypoxia. Intubation and ventilation may be required.

Blood dyscrasias
Clotting disorders (haemophilia, platelet disorders, etc.) predispose to the
same problems as anticoagulants. Leukaemic patients are also at increased
risks of severe infections. Sickle cell disease requires care with general
anaesthesia and can present acutely with severe pain in the mandible.

Previous injuries
Untreated or poorly treated facial fractures (e.g. nose, zygoma, or mandible)
may make it difficult to decide whether a new injury is a new fracture or just
bruising. Acute chest injuries preclude the use of entonox, which is particu-
larly helpful in reducing dislocations of the mandibular condyle.

Tetanus status
This is relevant to all lacerations, bites and abrasions. Wounds can be clas-
sified as tetanus prone or non-tetanus prone and, depending on the immu-
ization status, a booster course or immunoglobulin may be required.

Drug interactions
Commonly prescribed drugs include opiates, antibiotics, NSAIDs, and
sedatives. Each has the potential to interact with other commonly
prescribed medications from the patients GP. Remember also herbal
medicines (e.g. St Johns Wort)—they can also interact.

Anticoagulants
For example, warfarin and aspirin. Reduced clotting may have an impact fol-
lowing trauma in several ways. Head injuries are at an increased risk of
intra-cranial bleeding and may require admission for observation. Similarly,
retrobulbar haemorrhage and bleeding into easily distensible tissues (floor
of mouth, upper airway and eye) are more likely to occur following trauma.
to these sites. Pan-facial injuries may even require airway protection. Some authorities recommend avoidance of ID nerve blocks. Bleeding into large body cavities (chest, abdomen, pelvis) around fractures (limbs, retro-peritoneum) and externally can rapidly result in haemorrhagic shock. Check clotting and, if necessary, reverse the anticoagulant.

**Steroids**
Significant infections and trauma may require steroid supplementation. Chronic steroid use predisposes the patient to the risks of infection, poor wound healing, osteoporosis, and a diabetic potential, each with their own attendant problems.

**Alcohol intake**
Acute alcohol intoxication can result in agitation, unconsciousness, with loss of protective airway reflexes, and vomiting. In the head-injured patient this always makes assessment difficult. Never assume that the drowsy state is simply due to too much booze. Chronic alcoholics are often malnourished and self-neglected and at an increased risk of infections. If it is anticipated that the patient will not be able to drink alcohol for some time, get help in setting up an appropriate withdrawal protocol.

**Home circumstances**
One of the criteria for discharge of head-injured patients is appropriate home support. This involves regular observations for at least 24h by a responsible adult who can either bring the patient back to casualty or phone for an ambulance. If the patient lives in a remote area it might be better to consider overnight observation.

**Allergies**
Notably with antibiotics used to treat facial infections.

**Family history**
This may sometimes indicate potential risks from anaesthesia and patients should be asked about a history of malignant hyperpyrexia, porphyria, and, if of non-European decent, sickle cell disease.

People in certain occupations may be exposed to hazards that can produce respiratory disease. These include cancers (e.g. asbestos workers), infections (e.g. bird breeders), asthma (e.g. painters), pneumoconiosis (e.g. coal miners), allergic alveolitis (e.g. farmers).
Assessment of patients undergoing surgery

Consider the relevance of:
• age
• smoking
• alcohol abuse
• ischaemic heart disease
• respiratory disease (e.g., chronic obstructive airway disease)
• diabetes
• malnutrition
• blood disorders (haemophilia, sickle cell anaemia)
• head/facial injury
• cervical spine injury.

Assessment/management considerations:
• medical conditions
• deep vein thrombosis (DVT) prophylaxis
• antibiotic cover (ABC)
• steroid cover
• nutritional support
• effective pain relief
• stress ulcer prophylaxis
• early participation of physiotherapists, dieticians, speech therapists and social services.

Emergency surgery

Whereas patients undergoing elective surgery can be pre-assessed in good time, those requiring emergency surgery do not have this luxury and can only be rendered as fit as possible within the time allowed, depending on the degree of urgency. Relatively few emergencies need immediate intervention (such as airway obstruction, extra-dural haematoma, retrobulbar haemorrhage, etc.) and most can be delayed at least a few hours so that medical optimization is possible. In selected cases, some patients may benefit from a brief period of intensive management on a high-dependency unit (HDU) or intensive care unit (ICU). In all cases, early anaesthetist input is essential, particularly in those patients with potential airway hazards.

Principles of assessment
• History taking.
• Clinical examination.
• Special investigations.
• Clinical history:
  • presenting complaint history of presenting complaint
  • past medical/surgical history
  • drug history
  • allergies
  • systems enquiry
  • social/family history
  • pregnancy.
Cardiorespiratory assessment

Symptoms of cardiorespiratory disease:
- chest pain
- angina
- shortness of breath associated with exercise, cold, or after eating
- orthopnoea
- paroxysmal nocturnal dyspnoea (sudden shortness of breath at night-time)
- nocturnal cough
- ankle swelling
- claudication (calf pain on walking, relieved by rest)
- sputum production
- wheeze.

Risk factors for cardiac disease:
- smoking
- diabetes mellitus
- hyperlipidaemia and obesity
- hypertension
- male sex
- family history of cardiac disease.

Thorough assessment of the cardiovascular and respiratory systems is particularly important in patients undergoing surgery. Ischaemic heart disease (myocardial infarction, heart failure, angina), hypertension, asthma, chronic obstructive airways disease, chest injuries, and chest infections all significantly increase the risks of anaesthesia. Where non-urgent surgery is planned, deferral until the patient’s condition has been improved is advisable.

Myocardial infarction within the preceding six months is a recognized major risk factor to further infarction and perioperative death. When possible, surgery should be postponed until after this period; some authorities suggest a minimum of one year. Patients with a past history of rheumatic fever are predisposed to valvular heart disease, which can lead to heart failure and infection of the valves (infective endocarditis). Intra-oral procedures, especially those involving the teeth (e.g. removal) are well-recognized as high-risk procedures for this. These patients should ideally be seen by a cardiologist, who can assess cardiac function and advise about any risks of endocarditis. Patients at risk may require antibiotic cover, depending on the surgical procedure. Similarly, some types of congenital heart disease and all patients with artificial heart valves will require appropriate antibiotic cover (ABC) given just before surgery.

Chronic obstructive airways disease

Predisposes to post-operative chest infections and hypoxia. Cessation of smoking, pre-operative physiotherapy, and surgery carried out in the summer months, will all significantly improve post-operative recovery.

Pre-operative measures to reduce post-operative chest infection:
- being aware of high risk patients;
- forbidding smoking for at least a few days before surgery;
- timing elective surgery for summer months;
- improving lung function in asthmatics with nebulised beta antagonists and steroids pre-operatively;
physiotherapy;
• reserving beds in the high dependency or intensive care unit for patients who are particularly at high risk.

Tuberculosis is still seen, even in developed countries, especially among the homeless and deprived inner city areas where poverty and overcrowding contribute to its incidence.

**Diabetes mellitus**

Death and post-operative complications are more common in diabetic patients. This is due partly to controllable factors such as blood glucose, but also due to unavoidable complications such as ischaemic heart disease and infection, both of which are more common in these patients.

Risks to surgery in diabetic patients:
• acute hypoglycaemia
• ketoacidosis
• ischaemic heart disease
• hypertension (renal disease)
• increased risk of infections (chest, urinary, wound)
• predisposed to pressure sores.

The problems with diabetic patients undergoing major surgery are related to the enforced period of starvation (nil by mouth) and the metabolic effects secondary to the surgery itself. The main source of nutrition to the brain is glucose, yet persistently high blood sugar predisposes to infections, poor wound healing, and ketoacidosis. The aim of management is therefore to minimize gross variations in blood sugar by ensuring an adequate glucose, calorie, and insulin intake. Blood glucose needs to be within normal limits pre-operatively and maintained until normal feeding is resumed following surgery. For many patients, normal feeding may be delayed many days, especially following major resections for head and neck cancer. Pre-operative blood glucose control can be determined by urinalysis or a random blood sugar. Blood urea and electrolyte concentrations should also be checked to exclude renal disease. Pre-operatively, it is important to determine:
• the type of diabetes;
• the adequacy of blood glucose control;
• the treatment regime (diet, oral hypoglycaemic agent, or insulin);
• established complications (e.g. cardiovascular, renal);
• planned surgery;
• the likely delay in resumption of oral feeding.

Many regimes exist for stabilizing diabetic patients in the pre-operative period.

**General principles in diabetic management include:**
• getting expert help—liaise early with the anaesthetist, if the patient need an operation;
• establish good control of blood sugar long before surgery is planned;
• avoid long-acting insulin preparations or oral hypoglycaemic agents 12–24 h pre-operatively, to prevent hypoglycaemia;
• regularly monitor blood sugar;
• fast from midnight (if on morning list);
place patient first on the list;
• control blood sugar on the day of surgery using intravenous short-acting insulin and intravenous dextrose (many regimes exist);
• check potassium and supplement if necessary;
• post-operatively, continued use of a sliding scale until an adequate oral diet is re-established and then restart normal regime.

In acute cases blood glucose may be grossly abnormal secondary to infection, trauma, or reduced oral intake. Patients are often hyperglycaemic, which can lead to diuresis, dehydration, and ketoacidosis. These patients require intravenous rehydration, correction of sodium depletion, potassium supplementation, and infusion of short-acting soluble insulin. Regular monitoring of blood glucose, sodium, potassium, and acid–base balance is essential. When rehydration is underway and some correction of acidosis and hyperglycaemia has been achieved, emergency surgery may then be carried out continuing management during and after surgery.

**Sliding scales** involve the continuous infusion (sometimes subcutaneously) of a short-acting insulin, using a syringe pump. The rate of infusion varies according to the patient’s blood glucose, which is checked regularly (e.g. hourly, depending on its stability). The higher the blood glucose, the more insulin given. In this way, hyperglycaemia can be controlled without risking profound hypoglycaemia. Sliding scales should be **reviewed constantly** and adjusted to achieve a relatively steady infusion rate. The aim is to establish a steady blood glucose rather than constantly oscillating below a low and high insulin infusion rate.

**Bleeding disorders**
The presence of blood dyscrasias and other causes of delayed clotting must be considered, especially when there is prolonged bleeding following minor oral surgery. The commoner problems include haemophilia A, haemophilia B, Von Willebrand’s disease, liver disease, and patients on anticoagulants. Patients with known or suspected bleeding problems need to be fully assessed by an appropriate specialist, ideally in the out-patient clinic prior to admission. With appropriate prophylactic measures (e.g. local measures, tranexamic acid, DDAVP, factor replacement or adjustment of warfarin doses) surgery can be safely carried out, although the patient may need overnight admission. Patients on warfarin need careful assessment, as they may require adjustment of the dose until the INR is at an acceptable level. Opinions vary considerably as to what is ‘acceptable’, as reducing the dose of warfarin in itself is not without risks to the patient (inducing a hyperthrombotic state). Most maxillofacial units will, however, have established guidelines, which should be adhered to.

**Thyroid surgery**
Patients undergoing thyroid surgery for hyperthyroidism must be clinically and biochemically euthyroid before surgery is undertaken. Close co-operation with an endocrinologist is essential to optimize thyroid function prior to surgery.

**Deep vein thrombosis (DVT)**
Deep vein thrombosis, DVT, is generally uncommon following head and neck trauma or surgery. However, it is a potentially life-threatening condition
(pulmonary embolism, PE) and is preventable. Diagnosis is often difficult and it has been estimated that around half of patients with extensive thrombosis have no clinical findings. Such ‘silent’ thrombi are a particular risk where the condition may remain unrecognized until fatal pulmonary embolism has occurred. It is therefore important that patients are assessed for risk factors appropriate preventive measures taken.

**Risk factors for DVT include:**
- previous history of dvt or pulmonary embolism
- age
- myocardial infarction
- obesity
- extensive trauma
- infection
- congestive heart failure
- malignancy
- diabetes mellitus
- length and type of operation
- prolonged immobilization.

Other risk factors include:
- oral contraceptives
- smoking
- sex
- race
- occupation
- type of anaesthetic
- pregnancy and the puerperium
- varicose veins
- drugs.

**DVT prophylaxis**
Currently, prevention is directed towards elimination of stasis in the veins, or reducing the tendency to clot in the patient. Measures include:
- full length anti-embolism stockings
- physiotherapy
- intermittent pneumatic calf compression
- low voltage electrical calf stimulation
- early mobilization
- heparin.

Other prophylactic measures include intravenous low molecular weight dextran, oral warfarin.

Heparin is currently available as ‘fractionated heparin’ and ‘low molecular weight’, which are reported to be more effective but are more expensive. Low-dose subcutaneous heparin significantly reduces the incidence of DVT in general surgical and orthopaedic patients. Low molecular weight heparins may be given once daily, which is more convenient for staff and patient.

**Steroids in surgery ‘steroid cover’**
Patients on long-term or high-dose steroids, for whatever reason (asthma, rheumatoid arthritis, inflammatory bowel disease), are at risk of
adrenocortical suppression. Following surgery, trauma, and infections they are unable to mount a normal ‘stress response’, which can lead to metabolic disturbances and, occasionally, collapse. Steroid supplementation may be required in the peri-operative period, commencing on induction of anaesthesia and continued post-operatively with a reducing dose. For an ‘average’ nil by mouth (NBM) patient, one regime might be (protocals vary depending on patient and procedure):

- major surgery—hydrocortisone 100 mg IM or IV with the pre-medication and then four times daily for three days, after which return to previous medication;
- minor surgery—prepare as for major surgery, except that hydrocortisone is given for 24 h only.

**Stress ulceration**

This occurs in patients after prolonged physiological stresses and is classically seen following extensive burns, major trauma, and multi-organ failure. Patients undergoing surgery for head and neck cancer may similarly be ‘stressed’ post-operatively, particularly if their recovery is complicated. This can result in fatal gastro-intestinal haemorrhage and in such patients prophylaxis is necessary. Current measures include H₂ receptor blockade and sucralfate.
Assessing the elderly

This can be particularly challenging. Although the principles of assessment in the elderly are no different than in the younger population, some specific points are worth highlighting.

- Chronological age per se is no indication of relative risk; careful assessment is still necessary. Contrary to general belief, most old people are fit. A better indication is the ‘biological age’, i.e. how old the patient looks.
- Hypertension, ischaemic heart disease, and congestive cardiac failure are all common in the elderly and often undiagnosed.
- Several diseases or problems may coexist.
- Elderly patients are often taking one or more different drugs. These should generally be continued throughout the peri-operative period. The potential for drug interactions must always be considered during anaesthesia or drug prescribing. Many exist.
- Patients may have impaired metabolism and excretion of drugs.
- One problem (e.g. poor mobility) may have several causes, each requiring attention.
- Complications are relatively common and may present non-specifically, with absence of typical symptoms (e.g. myocardial infarction without chest pain or a urinary tract infection without dysuria). Rapid deterioration can occur if these are not recognized and treated.
- Incontinence, instability, immobility, hypothermia, and confusion are common problems in the elderly. However, they may be early symptoms of underlying treatable disease, e.g. UTI.
- More time is required for recovery.
- Many elderly people live alone and their social circumstances need evaluating. Early involvement of social services may prevent delayed discharge in patients who go on to become ‘social’ admissions.

For major surgery routine, pre-operative FBC, biochemistry, blood gases, and chest X-ray, are useful as a baseline against which post-operative investigations can be compared. This is essential in patients with long-standing medical problems and associated biochemical abnormalities. In patients undergoing surgery for malignancy, a chest X-ray is also important to exclude metastasis. A pre-operative ECG is mandatory in all elderly patients, as asymptomatic heart disease may be detected.

Physical examination of the head and neck needs to be tailored according to the individual requirement of the patient.
Physical examination

If at all possible, document clinical findings (notably injuries) photographically. Not only is this useful from a medico-legal perspective, but wounds, etc., can then be dressed and repeated examinations avoided. If photography is unavailable, use diagrams.

Extra oral examination

Inspection
Standing at a distance form the patient, take a general look at the head and neck. Note any asymmetry, lumps, trauma, discoloration, and muscular neuronal deficit. Remember the cranial nerves (especially II, V and VII)

Function
Check eye movements (blowout fractures), vision (ocular trauma), cranial nerves, swallowing, hearing, and jaw movements, where appropriate.

Palpation of the face
Depending on the presenting complaint, a thorough palpation of any visual findings is performed. This includes all surfaces that form the head and neck:
- scalp
- forehead
- supra-orbital ridges
- zygomatico-frontal sutures (lateral orbital margins)
- infra-orbital ridges
- nasal bridge
- maxilla
- zygomatic body and arch.
- temporomandibular joints
- mandibular ramus, body, and lower border
- mandibular range of movement, i.e. opening and lateral excursions
- surface of the neck down to the clavicle, cervical spine, and occiput.

Feel for tenderness, fluctuation, steps in bony continuity, and enlarged lymph nodes in the neck.

Auscultation
Can be considered for vascularized lumps (e.g. haemangioma, AVM, thyroid) or following trauma to the neck (carotid bruit).

Intra-Oral Examination

Occlusion (the bite)
Note whether it is deranged before asking the patient to open. If uncertain, then ask the patient to close their teeth together and retract the cheeks to see if there is contact at the back and front on either side. Ask the patient if the ‘bite’ feels normal. Be mindful of artificial teeth that can alter the occlusion without underlying bony trauma.

Teeth
Note presence in both the upper and lower alveolar ridges. These are ‘charted’ by assigning numbers to those present in each arch in relation to
their position. Following loss of a tooth, its neighbours will drift a little over several years. The more teeth that are lost, the more this can occur. This can make numbering difficult (e.g. is it a ‘6’ or a ‘7’?)

**Permanent dentition:** see Fig. 1.2.

**Deciduous dentition:** see Fig. 1.4.

**Mixed dentition:** Any combination of the above.

Following trauma, teeth must be accounted for to avoid the danger of aspiration. Empty sockets with blood clots or fractured teeth raises the index of suspicion.

Teeth have a very high potential for infection. Signs of damage to the crown, carious lesions, previous fillings, retained roots, and poor oral hygiene are the commonest vectors for a facial abscess. Unerupted/eden-tulous areas can have impacted/retained teeth or roots that can also be a source of dento-alveolar infection.

**Tongue**

Look for:
- any signs of neural weakness, i.e. slurred speech, tingling, or difficulty in swallowing;
- trauma, i.e. lacerations or haemorrhage;
- change in colour, texture, or size can be due to tumour, fungal infections, anaemia, folate, B12 deficiency, or acute cyanosis.

The condition of mucosa forming the floor of mouth under the tongue is noted. If enlarged it can raise the tongue. This may indicate spread of infection with a potential airway problem, or a sublingual haematoma following mandibular trauma.

**Gingival/oral mucosa**

Overlying the alveolar bone, hard palate, cheeks (buccal mucosa), and soft palate. No intra-oral examination is complete without looking at the back of the throat or tonsillar area. Presence of a swelling or discolouration needs to be further examined for size, tenderness, sinus tract, and whether it is associated with a tooth.

**Salivary flow**

The three paired parotid, submandibular, and sublingual salivary glands secrete into the oral cavity. Parotid glands discharge adjacent to the upper molar teeth through a papilla on the buccal mucosa. Submandibular and sublingual glands discharge though a papilla on either side in the floor of mouth near the lingual frenum. Ductal patency and gland function can be assessed by ‘milking’ or massaging the glands.

**Palpation**

This is just as important inside the mouth as it is on the face. Feel for lumps, swelling loose teeth, and fracture crepitus.
Fig. 1.1 Normal layout of the adult dentition.

Fig. 1.2

Permanent ("Adult") teeth

Right:

<table>
<thead>
<tr>
<th>1+2</th>
<th>3</th>
<th>4+5</th>
<th>6,7+8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incisor</td>
<td>Canine</td>
<td>Premolar</td>
<td>Molars</td>
</tr>
</tbody>
</table>

Left:

<table>
<thead>
<tr>
<th>1+2</th>
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<tbody>
<tr>
<td>Incisor</td>
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<td>Premolar</td>
<td>Molars</td>
</tr>
</tbody>
</table>

Total 32

Fig. 1.3 Know your teeth!
Differential diagnosis of 'the swollen face'

Fig. 1.4

- Deciduous ("Baby") teeth
- Right: cdbe, Left: abcd
- Total 20 teeth

Fig. 1.5 Mixed dentition.

Fig. 1.6 How old is the patient?
Preliminary assessment of multiple-injured patients—general points

Injuries to the head, face, and neck in the multiply injured patient need to be prioritized, taking into account other life- or limb-threatening injuries. Those injuries resulting in airway compromise, significant and ongoing bleeding, and possible loss of vision are a high priority. All other facial injuries can wait for at least a short while during which the entire patient is assessed.

The most widely adopted approach is that developed by the American College of Surgeons and known as Advanced Trauma Life Support or ATLS. This needs to be ‘second nature’ and implemented without delay. It consists of a rapid primary survey and secondary detailed assessment. The primary survey looks for and treats those conditions that would immediately threaten the life of the patient. This is performed in the order in which they would lead to loss of life quickest, and is conveniently placed in the order ABCDE. At the same time, care must be taken to avoid causing injury as a result of treatment (e.g. moving the neck).

Head and neck injuries resulting in life-threatening conditions

- **Facial injuries resulting in airway compromise** (e.g. pan-facial fractures with gross displacement, mobility or swelling, comminuted #s (# = fractures) of the mandible, gunshot, profuse bleeding, foreign bodies, burns, etc.).
- **Anterior neck injuries resulting in airway compromise** (e.g. penetrating injuries, circumferential burns, laryngeal/tracheal injuries).
- **Injuries resulting in profuse blood loss** (e.g. penetrating neck, pan-facial fractures—rarely).
- **Intra-cranial bleeding**. (eg extra-dural haematoma).

Once immediately life-threatening conditions are excluded or managed, several ‘adjuncts’ (CXR, lateral c-spine and pelvic X-ray) are undertaken. The patient should then be re-assessed and only when they are stable, with no immediate treatment necessary, can the secondary survey be carried out. This is when attention can be focused on the majority of facial injuries.
The primary survey

The primary survey in trauma is to get adequate oxygen into the blood and then circulate this, notably to the brain. To achieve this, patients need:

- a patent airway so that oxygen in the air can get to the lungs;
- adequate lung ventilation so that oxygen can pass through the alveoli into the blood;
- adequate oxygenated blood present to be circulated to the vital organs;
- the ability to use the oxygen at a cellular level (cf. cyanide poisoning);
- they also need the absence of any intra-cranial pathology that would irreversibly damage the brain.

The sequence in which the primary survey proceeds is related to those conditions that would lead to loss of life quickest:

- airway (while protecting the cervical spine to prevent neurological damage);
- breathing (all trauma patients should be given 100% oxygen), they may also need to be ventilated;
- circulation with control of haemorrhage;
- disability (brain function);
- exposure—this must be complete so a full examination front and back can be undertaken, however the patient needs to be covered to prevent hypothermia.

This is preferably done by a team approach, where different team members do the above simultaneously. In such cases a ‘team leader’ ensures that each is done. If team numbers are not sufficient for this, the above sequence is followed. It is also vital to enlist the help of any speciality not on the team if a problem or potential problem is identified that requires their input, e.g. neurosurgery.

Documentation of findings and interventions and investigations is important and should be complete.

The traditional full history taken from a patient prior to examination has no place in the preliminary assessment of the multiple injured patient. Instead an ample history will be necessary at an early stage.
History taking in major trauma—the ‘AMPLE’ history

Particular details may help understand the injuries or the effect of any potential treatment. These can be remembered by taking an ‘AMPLE’ history (see Table 1.1).

Table 1.1 History taking in major trauma—the ‘AMPLE’ history

<table>
<thead>
<tr>
<th>A</th>
<th>Enquire about any <strong>allergies</strong> related to medications.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Any <strong>medication</strong> that the patient is taking may alert us to potential problems following trauma, e.g. anticoagulants, or may give us a clue about pre-existing medical problems, e.g. cardiovascular medication. Some medications may alter the response to trauma and need to be taken into account, e.g. patients taking beta-blockers who are shocked may not exhibit the expected degree of tachycardia. Steroids also affect management. Remember herbal remedies—these can also interact with prescribed drugs.</td>
</tr>
<tr>
<td>P</td>
<td>A brief <strong>past medical history</strong> and <strong>pregnancy</strong>. Some conditions may influence management or alert us to other possible problems, e.g. the patient with known cardiovascular disease may have had a myocardial infarct before the car crashed. Age and reduced physiological reserve may necessitate careful fluid resuscitation.</td>
</tr>
<tr>
<td>L</td>
<td><strong>When the patient last ate.</strong></td>
</tr>
<tr>
<td>E</td>
<td><strong>Events</strong> leading to the trauma and is dealt with in the importance of the mechanism of injury.</td>
</tr>
</tbody>
</table>
History taking in major trauma—the mechanism of injury

Immediately following major trauma, it is inappropriate to spend time taking a lengthy detailed history from patients prior to examination and treatment. However, some information may give clues as to what injuries a patient may have. (i.e. the mechanism of injury). This may be available from the patient or witnesses or paramedical personnel attending the patient. Ensure a team member gets the information before the people who know it leave the department. As much detail as is known should be recorded.

For instance, if it is known that the mechanism involved a single blow (e.g. a stabbing in the neck) the risk of some injuries is higher than others. In this case, how long was the blade, which direction was the assault from (above/below, in front/behind), did the blade break and remains in situ. Here a pelvic, abdominal, and lower limb injury is unlikely, but chest, head, and upper limb trauma are all quite possible. There is the potential for direct airway, cervical spine, breathing, and circulatory problems from such a wound.

Mechanisms may be more complicated, e.g. road traffic accident (RTA), fall from a height, an explosion. In all these cases, detail helps assess risk. Speed of impact, seat-belt wear, vehicle deformity, injuries sustained by others (especially any fatalities), are all useful clues following RTAs. If the patient fell, from what height and what he/she hit when they landed are clearly important. Deceleration injuries are particularly worrying. With explosions, what exploded, were chemicals involved, and was fire or smoke present should be asked about? All these and other information help to raise the possibility of injuries over and above the obvious, which need to be looked for and either ruled out or treated.

In circumstances where the details are vague or incomplete, consider what might have happened in addition to what is known. A patient who has been assaulted but is not sure what happened may have obvious facial injuries, but may also have received ‘a good kicking’ to the chest or abdomen, resulting in potentially life-threatening injuries. These can easily go unnoticed if not looked for.

The time from injury to help arriving and transfer to hospital is important and should be ascertained, especially following severe burns. Environmental conditions should also be noted—has the patient being exposed to extreme temperatures and for a how long?
Primary survey—airway

- **Airway**—is it patent? Is it secure? Is there any danger of losing it?
  - **Speak to the patient**, if they reply in a clear manner, then they have an airway that is patent and have the capacity to use it. A *horse voice* may suggest airway injury.
  - Are there *gurgling/stridorous noises* indicating partial obstruction? This must be cleared immediately. Common causes are blood/saliva or the base of the tongue falling back against the pharynx. Other causes of obstruction may relate to swelling in the neck from bleeding or direct trauma to the airway (larynx/hyoid).
  - **High flow suction** should be used and the mandible manipulated forward to lift the tongue base (*chin lift/jaw thrust*). If it re-obstructs on release then an oro-pharyngeal, naso-pharyngeal or a definitive airway will be required. If patients require an oro- or naso-pharyngeal airway for more than a short while, they probably require a definitive airway.
  - If the **airway is silent**, it is either completely occluded or the patient is not breathing. In the former, movement of the chest will be apparent and the patient will be in distress. Immediate relief of obstruction is essential. In severe facial/neck trauma this may require a surgical airway.
  - **The anterior neck**. This is often a forgotten site and requires careful examination. It should be regarded as a watershed between ‘airway’ and ‘breathing’ during the primary survey. Life-threatening problems arising in both can manifest clinical signs here. Fractures of the larynx and hyoid may lead to substantial glottic swelling. A *horse voice*,
haemoptysis, and crepitus in the neck are highly suggestive of these injuries. Carefully palpate the hyoid and larynx. If the patient is not breathing, they require ventilating with oxygen either via bag and mask or a definitive airway. This is usually achieved by orotracheal intubation or via a surgical cricothyroidotomy. Naso-tracheal intubation is contraindicated in mid-facial trauma or head injuries.

Remember the risk to the cervical spine, which must be presumed injured. This must be stabilized using a correctly fitting collar, ‘sandbags’ and tape. If not available stabilise manually.

The comatose patient who has a patent airway and is breathing also requires a definitive airway to protect the airway in the event of vomiting.

Airway risk factors

- Physical findings of actual or potential obstruction.
- Inability to handle normal secretions.
- Foreign bodies.
- Altered level of consciousness (may be secondary to alcohol, drugs or some medical conditions).
- Uncontrolled haemorrhage.
- Surgical emphysema.
- Adjacent soft tissue injuries/gross swelling.
- Burns.
- Hyoid/laryngeal/tracheal injury.
- Disrupted mid/lower face anatomy.

Beware the patient who keeps trying to sit up—they may be trying to clear their airway. If no spinal injury, let them sit up; if unsure, either lay them on their side or tip the table head down. This is at variance with ATLS guidelines but facial bleeding will continue unrecognized in the supine position until the patient vomits and possibly aspirates. If the patient vomits, tip them head down and apply wide-bore suction—in practice there are usually not enough people immediately to hand to carry out a safe and co-ordinated log roll. Call for help.

Maxillofacial (trauma) emergencies—airway

Obstruction can be caused by dentures/teeth or severe fractures of the mandible or mid-face. The commonest cause is bleeding and/or saliva, notably when the patient is intoxicated or supine.

Mid-face fractures may displace downwards and backwards along the skull base, impinging on the posterior pharyngeal wall and resulting in obstruction. Bilateral anterior (‘bucket handle’) or comminuted mandibular fractures can similarly displace backwards allowing the base of the tongue to fall back. Both of these are much more likely when patients are supine and there is alteration in the conscious level. Both can be dealt with by pulling the fractured part forward to relieve the obstruction. This provides only temporary relief and a definitive airway will probably be required.

Saliva and blood should be cleared by suction. If the bleeding is ongoing from an identifiable source that can be stopped, it should be. However, it
is usually generalized from multiple sites. Displaced fractures should be manually reduced, as this often helps slow the bleeding. Nasal packs may be necessary (remember the possibility of skull base #). If bleeding continues, the airway should be protected with a definitive airway.

Direct trauma to the airway will probably require a definitive airway to be placed.

**Beware the patient who keeps trying to sit up—they may be trying to clear their airway**

**Airway with control of cervical spine**

As in all trauma patients, the first priority is to assess the airway **while protecting the cervical spine**. Initial assessment often simply requires a verbal response from the patient—‘what happened?’ followed by direct inspection of the mouth and pharynx for signs of potential obstruction. The cervical spine should be immobilized along the usual lines, unless the patient is highly agitated and thrashing around.

**Remember ‘airway’ is not just the mouth and obstruction may occur at any point from the lips and nostrils to the carina.** It may arise from foreign bodies (dentures), teeth, blood, secretions, or displaced/swollen tissues. The most common foreign bodies encountered in facial injuries are blood and vomit.

The risk of obstruction by the pooling of blood and secretions, is present in almost all patients with injuries to the face. This is made worse with displaced or comminuted fractures of the mandible, where swallowing may be painful. Early signs may be easily missed, particularly when dealing with patients who are intoxicated or have a significant head injury. Not only are they at risk of vomiting, but coma predisposes to loss of protective airway reflexes and care must be taken if these patients are positioned supine, as indicated in the ATLS approach.

If the patient has sustained major facial injuries be cautious and maintain an index of suspicion if he/she wishes to sit up. This may

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**Fig. 1.8** The commonest cause of airway obstruction following facial injuries is probably a mixture of concussion, alcohol, and foreign bodies (blood, saliva) at the back of the mouth—do not leave patients unsupervised in this position.
indicate concealed mid-face bleeding and awake patients may prefer to sit forwards and drool, allowing the blood and secretions to drain from the mouth, rather than lie supine according to ATLS principles. A judgement call is unfortunately required when positioning the patient with an isolated injury. When multisystem injury is suspected, special care is necessary. **Patients should never be forced or restrained onto their backs, as this is more likely to compromise both the airway and any occult cervical spine injury.**

**Loss of tongue support** may occur with bilateral (so called ‘bucket handle’) or comminuted anterior mandibular fractures. However, in the awake patient, airway control may still be possible. It is in the supine, head injured, or intoxicated patient, that loss of tongue control and other protective reflexes may become a problem. **Comminuted, and therefore high energy fractures**, of the mandible carry a greater risk as there is very little tongue support. In addition significant soft tissue swelling and intra-oral bleeding may be associated.

Occasionally **displaced facial fractures** may cause airway problems. Severe injuries to the middle-third of the face may result in comminuted fractures that are displaced backwards and down the inclined surface of the skull base. This can result in impaction of the posterior face (notably palate) on to the pharynx. Combined mandibular and middle-third facial fractures are indicative of major trauma and, therefore, predispose to airway problems. These patients commonly have an associated head injury, which compounds the problem. They also have a tendency to bleed profusely and suffer from severe soft tissue swelling.

**Soft tissue swelling** inevitably occurs with these major injuries, often necessitating prolonged intubation or an elective tracheostomy. However, major swelling can also occur in the absence of any fracture, as occasionally seen in patients taking anticoagulants, or those with clotting abnormalities. Patients with cervical spine fractures may develop posterior

Fig. 1.9 Comminuted fractures place the airway at risk. Comminution implies a high transfer of energy—think about soft tissue swelling.
pharyngeal swelling contributing to an obstructed airway. Penetrating and blunt (e.g. strangulation/hanging) neck trauma may also be associated with pharyngeal oedema and bleeding. It is important to appreciate that swelling from whatever cause can take several hours to develop. Be wary and regularly re-examine the patient. Of particular concern are those patients who have suffered facial burns. These are frequently associated with inhalation injuries, which can lead to rapid swelling that is not appreciated on initial examination. **Stridor is a particularly worrying sign and often necessitates early intubation.**

The anterior neck
This is often a forgotten site and requires careful examination. It should be regarded as a watershed between ‘airway’ and ‘breathing’ during the primary survey as life-threatening problems in both can manifest clinical signs here. Pouiselle’s law dictates that even a small change in the diameter of a tube can result in a significant change in flow through it. Although strictly applicable to fluid dynamics, this equation highlights the potential for problems to arise with swelling in the larynx and trachea. Although unusual, fractures of the larynx and hyoid do occur and may lead to substantial glottic swelling. **Motorcycle helmet wearers, strangulation, and contact-sports injuries** are important clues from the history. A **hoarse voice, haemoptysis, and crepitus in the neck** are highly suggestive of these injuries and should be actively sought after. Carefully palpate the hyoid and larynx for signs of injury, and look for external swelling, which may reflect swelling internally.

Airway maintenance techniques
Control of the airway can be easily lost and may be very difficult to secure following facial trauma and burns. **All trauma patients should receive**
oxygen. Often early assistance from an experienced anaesthetist is required and should be anticipated well in advance of signs of impending obstruction. Occasionally an immediate surgical airway is required, notably when there is gross swelling in pan facial injuries. Members of the trauma team should be competent in performing this.

Airway maintenance techniques include:
- suction
- jaw thrust
- chin lift
- oro-/nasopharyngeal airways
- tongue suture
- laryngeal mask.

Several techniques exist for ‘maintaining’ an airway. However, it is important to appreciate these are not the same as ‘securing’ the airway and their effectiveness may be lost. High-volume suction using a wide-bore soft plastic sucker should be readily available to clear the mouth, nose, and pharynx of blood and secretions, taking care not to induce vomiting. Loss of the protective gag reflex should prompt consideration of an oro-pharyngeal airway or even intubation.

The jaw thrust and chin lift techniques are commonly used techniques but are occasionally not effective in the presence of severely comminuted mandibular fractures. In these cases it may be useful to use a tongue suture or even a pointed towel clip to initially control an obstructing tongue. Oro-pharyngeal airway (Guedel), naso-pharyngeal airway, and laryngeal mask airways (LMA) are all useful additional techniques available for maintaining an airway. However, it should be remembered that LMA can often induce vomiting and that none provide a definitive and secure airway. The use of a naso-pharyngeal airway (and naso-tracheal tube) is usually contraindicated in mid-face injuries or suspected basal skull fracture. Basal skull fracture should be suspected in the
presence of periorbital ecchymosis (raccoon eyes), mastoid ecchymosis (Battle’s sign), VIIth nerve palsy, and CSF leaks.

Posteriorly displaced middle third fractures may be disim pact ed to improve the airway. Grasping the maxilla and pulling it anteriorly achieve this. It may be necessary to support this with a mouth prop, provided the patient has an intact lower jaw. This has the additional benefit of controlling haemorrhage from middle-third facial fractures.

**Definitive airways**
- Oro-endotracheal intubation.
- Naso-endotracheal intubation.
- Surgical cricothyroidotomy.

A definitive airway may be defined as a **cuffed tube in the trachea**. It may be required if there is any doubt about the patient’s ability to protect their own airway immediately or in the near future. In the emergency situation, it is important that the technique used is one with which the clinician is most confident; the trauma setting is not the time to attempt unfamiliar procedures.

Oro-tracheal intubation with in-line cervical immobilization is usually the technique of choice in the majority of cases. In the absence of mid-facial or cranio-facial fractures, alternative techniques include blind naso-tracheal intubation or fibre-optic assisted oro- and naso-tracheal intubation. Together with surgical airways, these techniques have been shown to be associated with less manipulation of the injured cervical spine. However, they require extensive training. **Naso-tracheal intubation is potentially dangerous—the anterior cranial base can be inadvertently ‘intubated’ through an unrecognized fracture.** The use of fibre-optic assistance is usually limited, as the view is often obscured by blood. Retrograde intubation avoids cervical spine manipulation but its use is not well established in the trauma setting.

The only indication for creating a surgical airway is failure to secure the airway by any other way. Surgical airways include needle cricothyroidotomy and surgical cricothyroidotomy. **Tracheostomy is now generally regarded as obsolete in the trauma setting** as it is too time-consuming to perform and potentially unsafe. The key factor in performing a needle or surgical cricothyroidotomy is identification of the cricothyroid membrane, which should be possible, provided the anterior neck is not too oedematous. A needle cricothyroidotomy may be used to provide oxygenation while preparing for surgical cricothyroidotomy. It is not secure but may be used in extremis while a definitive (surgical cricothyroidotomy) airway is secured.

**Emergency surgical airways**

In less emergent cases, an airway can usually be secured by other measures. This depends upon the particular circumstances and includes the use of:
- suction
- tongue suture
- chin lift/jaw thrust
- nasopharyngeal/oropharyngeal airway
- nasotracheal/orotracheal intubation
- cricothyroidotomy
- tracheostomy.
Fig. 1.12  These demonstrate several important principles in securing an airway following serious facial injuries: organization, team-work, c spine immobilization during and after intubation and cricoid pressure (patient was also pre-oxygenated).

Fig. 1.13  These demonstrate several important principles in securing an airway following serious facial injuries: organization, team-work, c spine immobilization during and after intubation and cricoid pressure (patient was also pre-oxygenated).
These demonstrate several important principles in securing an airway following serious facial injuries: organization, team-work, c spine immobilization during and after intubation and cricoid pressure (patient was also pre-oxygenated).

Which method is used depends on:
- type of obstruction
- urgency of airway
- conscious level
- presence or suspicion of cervical spine injury
- experience and skills of clinician.

Indications for urgent surgical airways include:
- actual or potential obstruction
- laryngeal fractures
- upper tracheal injury (if unable to intubate)
- in all cases supplemental inspired oxygen is necessary.

Most authorities generally agree that the most appropriate emergency surgical airway for upper airway obstruction is through the **cricothyroid membrane rather than a tracheostomy**. If time allows, a stab incision is made through which a small cuffed tracheostomy or endotracheal tube is passed. Formal tracheostomy takes longer to perform, is more difficult, and has potentially more serious complications. However, fractures of the larynx may make cricothyroidotomy impossible, in which case a tracheotomy should be undertaken. In extreme conditions access can be established by passing a brown or grey venflon through the cricothyroid membrane. This can then be connected to oxygen via a “Y” shaped cannula. It is however only a temporary measure.

Full c-spine immobilization includes not just the neck but **immobilization of the entire spine**. Movement lower down the spine will result in a degree of movement in the neck. Furthermore injuries of the c-spine
may be associated with spinal injuries elsewhere. These also need to be protected.

Following significant injuries most patients arrive supine with
- **spinal board** (solid inflexible plastic board the length and width of the patient with straps that hold the patient rigid across the chest, pelvis and legs);
- **blocks** (usually foam filled rubber coated blocks about the size of a shoe box, on both sides of their head, preventing the neck from rotating, radiolucent to allow radiographic examination of the spine);

![Fig. 1.15 Surgical cricothyroidotomy NOT tracheostomy.](image)

![Fig. 1.16 Correct spinal immobilization.](image)
• **tape** (often simple elastoplast tape but more commonly two purpose-made straps, one across the mandible, the other across the forehead, holding the head down on to the spinal board);

• **hard collar** (stiff plastic neck collar that holds the cervical spine more stable by reducing flexion, extension, and lateral flexion of the neck).

Go to your A&E department, and ask to see these items, be familiar with how they are applied and taken off. Better to learn now than have to learn during the real thing!
Primary survey—breathing

All patients must be given 100% oxygen.

- Is the patient breathing adequately? Speak to them. Can air be heard entering the lungs? If not, determine and treat the cause (pneumothorax/haemothorax, etc.).
- Comatose patients (head injury/drugs/alcohol may be hypoventilating. Attach a pulse oximeter and get some blood gases.

Conditions affecting ventilation

If you are a member of the ‘ATLS Fan Club’ you will remember life-threatening ‘B’ problems:

- **Airway:**
  - foreign bodies in the chest—emergency bronchoscopy;
  - aspiration—supportive care;
  - inhalation injury—supportive care.
- Tension pneumothorax—needle decompression and formal chest drain.
- Large (massive) haemothorax—volume replacement and chest drain.
- Sucking chest wound (open pneumothorax)—three-sided dressing initially then chest drain.
- Flail chest—analgesia, monitoring, and ventilatory support.
- Cardiac tamponade—analgesia, monitoring, and ventilatory support.

In the context of maxillo-facial injuries, breathing problems may occur following aspiration of teeth, dentures, and other foreign bodies. If teeth or dentures have been lost and the whereabouts unknown, a chest and neck radiograph should be taken to exclude their presence in the pharynx or lower airway. Unfortunately acrylic, from which ‘plastic’ dentures are made, is not very obvious on a radiograph and a careful search is necessary. All foreign bodies need to be removed.
Primary survey—circulation

The commonest cause of preventable death following trauma is shock, usually hypovolaemic. This results in inadequate perfusion of the tissues. ‘Any patient that is cool and tachycardic is in shock until proven otherwise.’ This may be due to blood loss, or the pump (heart) is not working properly. Other less common causes are also recognized.

Assess:
- pulse
- capillary refill
- presence of cool clammy peripheries
- mental status
- respiratory rate
- blood pressure
- urinary output.

Remember—blood pressure does not drop until late in the development of shock.

All trauma patients should have good intravenous access and blood taken for cross match. Initially warmed crystalloid (this varies in different units) should be infused and the patient’s response reassessed. The source of blood loss must be identified and further stopped—‘putting the plug in the bath’.

Sources of major blood loss:
- external wounds
- chest
- abdomen
- retroperitoneum

Fig. 1.17 Apparent minor injuries can result in major complications—always consider a CXR when lost teeth cannot be accounted for.
CHAPTER 1 General assessment

Fig. 1.18 Apparent minor injuries can result in major complications—always consider a CXR when lost teeth cannot be accounted for.

- pelvis
- limbs.

Life-threatening haemorrhage from head and neck injuries is uncommon but does occur. Consider:
- epistaxis—if supine this may go unnoticed as the blood is swallowed;
- mid-face/displaced mandible fractures;
- lacerations to the neck and scalp;
- blood loss in children is more significant.

The chest, pelvis, and limbs can be assessed clinically and radiographically, the abdomen cannot be reliably assessed clinically, especially in the unconscious patient, and may require further investigations (peritoneal lavage, ultrasound or CT). Immobilization of limb/pelvic fractures and a laparotomy for bleeding should be regarded as part of ‘C’ and not delayed.

In transient responses and non-responders to the fluid challenge, especially in injuries above the diaphragm, other causes should be considered—cardiogenic, tension pneumothorax, cardiac tamponade, spinal, or septic.

Children, the elderly, athletes, and patients with pacemakers or on beta-blockers may respond differently to blood loss.

Maxillofacial (trauma) emergencies—bleeding

Bleeding from maxillofacial injury is common but not usually life-threatening. If the patient is in shock, look for another cause. Actively consider facial bleeding as supine patients will be swallowing blood which will go unnoticed.

If significant and obvious, bleeding is controlled in the primary survey by pressure. Bleeding from lacerations can usually be controlled by pressure.
applied either with a swab (care with scalps if risk of skull fracture) or by placement of sutures to close lacerations. They are used to apply pressure and not intended as definitive closure.

Mid-face bleeding can be troublesome. Bleeding arises from multiple sites within comminuted bones and torn mucosa. Pressure can be applied to the nose with anterior and posterior nasal packs. Displaced/mobile mid-face fractures should be reduced. Gentle pressure can be applied antero-superiorly on the maxilla and maintained by placing mouth props bilaterally against an intact mandible. Surprisingly this is not as painful as one might think. In selected cases, use of external fixators applied to the skull and maxilla may be necessary, but this requires transfer to an operating theatre and considerably more time.

Bleeding from a ‘hole’ (e.g. following a gunshot) can sometimes be stemmed by placing a urinary catheter in the hole and inflating it. Obviously be careful and think what may be in the depths of the hole!

If local pressure is not sufficient to stop haemorrhage from either soft or hard tissue injury the use of angiography and embolisation or ligation of external carotids should be considered. This is rare.

Circulation—with control of haemorrhage

‘Any cold and tachycardic patient should be considered to be in hypovolaemic shock until proven otherwise’ (ATLS).

When shock is present, facial injuries are unlikely to be the sole cause. Look carefully for occult bleeding elsewhere (consider chest, abdomen, pelvis, retroperitoneum, limbs, and on the floor). However life-threatening, facial haemorrhage has been reported to occur in up to 10% of serious facial injuries. Blood loss from the scalp, face, and neck can be profuse. This is difficult to control due to the extensive collateral blood supply derived from the internal and external carotid arteries, bilaterally. Bleeding may be either revealed or concealed. Bleeding from comminuted fracture sites and soft tissue injuries can contribute to hypovolaemia and should be considered in all mid-face injuries. In such patients the bleeding is usually from multiple sites rather than from a named vessel, making control problematic. Concealed bleeding may occur in the supine patient, and is worth remembering as its contribution to persisting shock may not be recognized until the patient vomits and aspirates.

Arterial blood gases are particularly useful in the evaluation of haemorrhagic shock. A raised base excess and lactate often represents lactic acidosis and is an indication of tissue hypoperfusion.

Shock management

The first priority is to stop obvious and significant blood loss followed by good intravenous access through which fluids may be delivered quickly. Direct pressure, sutures, haemostatic clips, and diathermy may all be used to control obvious visible bleeding, for example, from the scalp. However, these techniques only have a limited application in facial injuries as bleeding often comes from deep within the nasal and oral cavity. Manual reduction of mid-face fractures is frequently effective in controlling bleeding, although it may be unsuccessful if severely comminuted. This is comparable to the reduction of a displaced femoral fracture limiting haemorrhage. This is surprisingly not as painful as one
might think. In selected cases use of external fixators may be necessary but this requires transfer to an operating theatre and considerably more time.

**Oral bleeding**
This may be controlled with dental gauze packs and manual reduction of obviously displaced jaw fractures. The amount of blood loss is often over estimated as the patient often salivates profusely.

**Epistaxis**
This may be controlled using nasal balloons or packs. If the source of nasal bleeding is high in the posterior nasopharynx, **Foley catheters** can be passed via both nostrils into the post-nasal space and then inflated with 10–20 ml of saline. Again, a judgement call is required with pan-facial injuries due to the **risk of cranial intubation**. Furthermore, inflation of the balloons may distract cranio-facial fractures, thereby increasing blood loss. Temporary stabilization of the fractures using a mouth prop may be necessary before these manoeuvres are attempted. Once inflated, gentle traction can then be applied ‘wedging’ the balloons in the naso-pharynx. Light anterior nasal packs can then be placed. There is an increased risk of sinusitis and the patient should be commenced on appropriate antibiotics. If CSF leakage is also present there is a risk of brain absscess.

![Manual reduction of midface fractures is frequently effective in controlling bleeding (why is this patient sitting up?)](Fig. 1.19)
Fig. 1.20  If the source of nasal bleeding is high in the posterior nasopharynx, Foley catheters can be passed via both nostrils into the post-nasal space and then inflated, followed by anterior packs.

Fig. 1.21  Lateral face and skull view following digital subtraction angiography, prior to embolization.
If local pressure is not sufficient to stop haemorrhage from either soft or hard tissue injury the use of angiography and embolisation, or ligation of external carotids should be considered. This is rare.

**Surgical intervention**
If control of bleeding is not possible, it is important to consider a coagulation screen, prior to surgical control. Surgery may involve ligation of the external carotid via the neck and ethmoidal arteries via the orbits. However, to do so requires a general anaesthetic and, because of extensive collateral supply, may be necessary on both sides. Alternatively, endoscopic techniques such as transantral and intra-nasal approaches may be used. These are of limited use in pan-facial fractures, where multiple bleeding points may be present both in bone and soft tissues. These techniques are best used in localized nasal injuries resulting in uncontrollable epistaxis. Given that the face has a very rich blood supply, the more distal a clip or tie is applied, the more effective the treatment becomes.

**Supra-selective embolization**
The use of supra-selective embolization in trauma is controversial but has been reported to be very successful and has certain advantages over surgery. It is increasingly used in extremity trauma and bleeding secondary to pelvic fractures. Catheter-guided angiography is used to first identify and then occlude the bleeding point or points. This involves the use of balloons, stents, coils or poly vinyl alcohol (PVA).

Supra-selective embolization can be performed without the need for a general anaesthetic and in experienced hands is relatively quick. Its value, therefore, is seen in the unstable patient. Multiple bleeding points can be precisely identified and the technique is repeatable. However, immediate access to facilities and on-site expertise are essential. Complications include intolerance to the iodine and, following extensive embolization, end-organ ischaemia and subsequent necrosis. Stroke and blindness have also been reported.
Primary survey—disability

Head injury is a common cause of morbidity and mortality after trauma because of the resulting injury to the brain. The injury may be primary, occurring at the time of the traumatic episode. Other than preventive measures, there is little that can be done about this. Secondary injury occurs later and can be due to reduced perfusion, inadequate oxygenation, and raised ICP—all of which we can do something about.

Assessment is made using the Glasgow Coma Scale (or AVPU) and pupillary responses. The GCS cannot be accurately interpreted until A, B, and C are optimized. Changes in the GCS with time are more significant than an individual reading. A decrease by 2 points (and the development of a dilated pupil, deviated laterally and downward) indicates a critical head injury. After Airway Breathing and Circulation have been addressed, this requires emergent neurosurgical evaluation.

CT scanning is often used to assess head-injured patients. Patients must be stable prior to transfer to CT—‘the doughnut of death’(!)

Remember—all facial injuries are technically head injuries, which take priority in assessment. Potential complications include:

- associated spine injury
- reduced airway protection
- profuse bleeding
- blindness.

Following trauma vision can be threatened anywhere along the visual pathway from globe to cortex. The main (potentially treatable) causes to consider are:

- direct globe injury
- retrobulbar haemorrhage
- optic nerve compression
- loss of eyelids.

Direct injury to the globe requires urgent ophthalmic referral.

Retrobulbar haemorrhage

Bleeding behind the globe is a form of compartment syndrome. This is a surgical emergency. It can lead to an increase in pressure that results eventually in irreversible ischaemia of the retina and optic nerve. Key symptoms are:

- severe pain and progressive loss of vision;
- the eye becomes proptosed with ophthalmoplegia and development of a fixed dilated pupil as the vision deteriorates.

Treatment requires immediate relief of pressure. In the emergency department the following should be given intravenously:

- acetazolamide
- mannitol
- steroids,

during which arrangements are made for surgery. Under LA a lateral canthotomy may be possible but these measures really only buy time while preparation for surgery is made. Deffinitive treatment involves drainage of
Fig. 1.22 All facial injuries are technically head injuries, which take priority in assessment.

Fig. 1.23 Retrobulbar haemorrhage.
the haematoma. Decompression should lead to an improvement in visual acuity if undertaken early enough.

**Traumatic optic neuropathy**

Traumatic optic neuropathy occurs when there is disruption around the optic canal resulting in either compression of the optic nerve, shearing forces to the nerve as it passes through the canal, or haematoma formation within the nerve itself. Untreated it can render the patient blind and the diagnosis needs to be made early to allow the best chance of visual recovery. The signs that suggest an optic nerve injury include **poorly reactive pupil, afferent papillary defect, and decreased colour vision, decreased visual acuity with relatively normal ocular examination**. This is an ophthalmic emergency and should be referred accordingly.

Treatment of optic nerve compression is controversial and again may be either medical or surgical. The options include observation, IV corticosteroids, and optic nerve decompression. The latter option is carried out via either a craniotomy approach or lateral facial approach.

One steroid regime is:
- methylprednisolone 30 mg/kg STAT, followed by
- methylprednisolone 15 mg/kg every 6 h.

Of course others exist.

**Time is of the essence, best results are obtained if steroids are given within 8 h of the injury.**
Primary survey—initial investigations

- During ‘A’—clinical assessment.
- During ‘B’—clinical assessment + O₂ saturation.
- During ‘C’—clinical assessment + ABGs, FBC, U&E, RBS, coagulation screen, cross match (type specific) and, if possible, pregnancy test in females.
- After ‘D’ and ‘E’—chest, pelvic and c-spine X-ray (the latter is not mandatory as long as the c-spine is immobilized).
- Urinary catheterisation.
- Oro-gastric or naso-gastric (if no risk of # skull base) tube placement.
- Often serial investigations are necessary (ABGs, CXR)—remember these only reflect the condition of the patient at the time they were taken.
- Facial X-rays can wait.

CSF leaks

Facial fractures that extend into the base of the skull (e.g. Le Fort II, Le Fort III, naso-ethmoidal and occasionally fractures involving the mandibular condyle), can tear the dural lining and allow cerebral spinal fluid (CSF) to leak from the nose (rhinorrhoea) or from the ear (otorrhoea). Clear CSF tends to mix with blood and presents as a heavily blood-stained, watery discharge. This trickles down the side of the face, where peripherally the blood tends to clot while the non-clotted blood in the centre is washed away by CSF. This creates two parallel lines referred to as ‘tramlining’. One test for CSF is the ‘ring test’ (allow drops to fall on blotting paper, blood clots centrally, the CSF diffusing outwards to form a target sign). Other tests include examining for eosinophils and sugar. This is helpful in distinguishing between CSF and mucus. More sensitive indicators include B2 transferrin and tau protein, although practically it is easier to simply assume that a leak is present. Tell the patient not to blow their nose for three weeks (see Head injuries).
Primary survey—re-assessment

This should be an ongoing part of the initial management of the trauma patient. All interventions that are undertaken should be reviewed—the condition of the patient should improve! If at any point during resuscitation the patient deteriorates reassess, starting with the airway.

At the end of the primary survey review, the patient along with any results of investigations to ensure they are stable and life threatening problems have been dealt with. Only then can a complete secondary survey examination be undertaken and attention to the face be drawn.

At some point the patient will need to be ‘log rolled’ to allow inspection of the back. Timing depends on likelihood of certain injuries—it may be necessary during ‘B’ if a penetrating injury is suspected (open pneumothorax).

Antibiotics, steroids, and tetanus prophylaxis

Protocols may vary between different units. Antibiotics are usually given for fractures, which are compound (open) into the mouth or through the skin (e.g. mandible). Oral bacteria of a mixed anaerobic type and a combination of a penicillin and metronidazole is one suitable choice.

Prophylactic antibiotics when there is CFS leakage is controversial and the opinion of a neurosurgeon should be sought. At the time of writing, the current advice of the Infection in Neurosurgery Working Party is not to use them—they do not prevent meningitis as they penetrate poorly into the CSF in the absence of infection, but kill of the normal flora. You are thus more likely to get meningitis by a multi-resistant organism.

Tetanus prophylaxis should be considered especially in mucky wounds, which should be thoroughly cleaned as soon as possible. Steroids, e.g. dexamethasone/methylprednisolone are often given to reduce facial swelling.

Fig. 1.24 Tramlining—an indication of CSF leakage.