2 Medical history, examination, investigations and risk assessment

KEY POINTS

- Crucial history-taking includes (A–E):
  1. allergies
  2. bleeding tendency
  3. cardiac history
  4. drug history
  5. endocrine disease (e.g. diabetes)
- Patients may be unclear about, or unaware of or not disclose their medical history or drug history
- Confidentiality is essential

PROTECTING PATIENTS

Health care aims to improve the health of patients but can itself carry risks. The first principle should be to do no harm (*primum non nocere*). Nevertheless, a UK report estimated that up to 18% of the population believe that they have suffered from a 'medical error', 10% of hospital admissions may result in something going wrong and 5% have had adverse effects from medical care. In a survey of Dutch oral surgeons who had had, on average, 21 years of work experience, 40% of respondents confirmed that they had experienced the death of a patient after oral surgery. Most of these patients had died after a dental extraction, the most important causes of death being postoperative spread of an infection, failure to survive cancer treatment, or heart and/or lung failure.

Operations are now associated with far less morbidity and mortality than formerly but there remains room for improvement. Morbidity and mortality in the dental surgery providing local anaesthesia (LA) and conscious sedation (CS) are rare but greater in patients with medical and/or dental problems; for example, extractions attributed to dental infections were significant predictors for risk factors for myocardial infarction compared with tooth extraction for trauma and other reasons in an Oslo study. Deaths as a result of the use of general anaesthesia (GA) in the dental surgery in the past were few but nevertheless provoked widespread public concern, and it is no longer permissible for a dentist in the UK to act as anaesthetist (this had been the case for some time in some other countries). *GA must only be given in a hospital with critical care facilities – because of the need to have resuscitation equipment available – and must be carried out by a qualified anaesthetist.*

If working in hospital, however, dentists may be required to assess patients for GA and to ensure that essential prerequisites are met before GA, and may need to manage GA patients postoperatively. They must therefore have an understanding of risk assessment and perioperative care.

RISK ASSESSMENT

At the start of a patient's visit, it is essential to:

1. obtain a careful medical, dental, family, social (and sometimes developmental) history, and make a risk assessment
2. assess the patient's needs and agree them with the patient
3. obtain the patient's valid consent to any investigations required
4. obtain the patient's consent to an agreed treatment plan.

Adequate risk assessment is essential and endeavours to anticipate and prevent trouble. The criteria of 'fitness' for a procedure are not absolute but depend on a number of factors, as shown in Box 2.1. Dentistry should be very safe, especially if the procedure is not dramatically invasive and the patient is healthy.

Surgical procedures are generally the most hazardous. The World Health Organization (WHO) recognizes this and grades risks on the basis of severity of the procedure (Table 2.1). WHO also identifies three phases of an operation at each of which, for patient safety, a checklist coordinator must confirm that the surgery team has completed the listed tasks before it proceeds:

- Before anaesthesia induction ('sign in')
- Before skin incision ('time out')
- Before the patient leaves the operating room ('sign out').

Drug use is also potentially dangerous; all agents should be carefully administered, particularly those acting on the neurological system and affecting consciousness and cardiac or respiratory functioning (e.g. sedatives and anaesthetic agents). Most oral care is given under LA and then morbidity is minimal. CS is not as safe as LA, though considerably safer than GA. Even so, CS must be carried out in appropriate facilities, by adequately trained personnel and with due consideration of the possible risks. By contrast, GA with intravenous or inhalational agents is only occasionally required for dental treatment and then only in a hospital setting; control of vital functions is impaired or lost to the anaesthetist. As stated above, GA is only permitted in a hospital with appropriate resuscitation facilities.

A patient attending for dental treatment who is apparently 'fit' may actually have serious systemic disease(s) and be taking drugs (including recreational drugs), either or both of which might influence the health care required. Many patients with life-threatening diseases now survive as a result of advances in surgical and medical care, and either or both can significantly affect the dental management or even the fate of the patient. Though this is most likely when treating hospital patients and other risk groups such as older people, one study showed that 30% of dental patients have a relevant medical condition. The risk is greatest when surgery is needed, and when GA or CS are

Box 2.1 *Factors influencing outcomes of health-care procedures*

- Health of the patient
- Type of procedure
- Duration of the procedure
- Degree of trauma and stress
- Degree of urgency of the procedure
- Skill and experience of the operator
- Skill and experience of the anaesthetist/sedationist
- Facilities and equipment

Table 2.1 *WHO grades of surgery*

Grade	Termed	Includes
1	Minor	Excision of skin lesion; drainage of breast abscess[a]
2	Intermediate	Primary repair of inguinal hernia; excision of varicose vein(s) of leg; tonsillectomy/adenotonsillectomy; knee arthroscopy
3	Major	Total abdominal hysterectomy; endoscopic resection of prostate; lumbar discectomy; thyroidectomy
4	Major+	Total joint replacement; lung operations; colonic resection; radical neck dissection; neurosurgery; cardiac surgery

[a] Includes dentoalveolar surgery.

Table 2.2 *Risk assessment and management*

Risks increased by	Risks reduced by
Increasing age	Planned treatment
Medical treatments	Non-invasive procedures
Surgical treatments	Monitoring
Lengthy dental procedures	Reassurance
Drug use – medication or recreational	Competent operator

Table 2.3 *American Society of Anesthesiologists (ASA) classification*

ASA class	Definition
I	Normal, healthy patient
II	A patient with mild systemic disease (e.g. well-controlled diabetes, asthma, hypertension or epilepsy), pregnancy, anxiety
III	A patient with severe systemic disease limiting activity but not incapacitating (e.g. epilepsy with frequent seizures, uncontrolled hypertension, recent myocardial infarct, uncontrolled diabetes, severe asthma, stroke)
IV	A patient with incapacitating disease that is a constant threat to life (e.g. cancer, unstable angina or recent myocardial infarct, arrhythmia or recent cerebrovascular accident)
V	Moribund patient not expected to live more than 24 h with or without treatment

Table 2.4 *American Society of Anesthesiologists (ASA) grades II and III*

	ASA II	ASA III
Chronic obstructive pulmonary disease (COPD)	Cough or wheeze; well controlled	Breathless on minimal exertion
Angina	Occasional use of glyceryl trinitrate (GTN)	Regular use of GTN or unstable angina
Hypertension	Well controlled on single agent	Poorly controlled; multiple drugs
Asthma	Well controlled with inhalers	Poorly controlled; limiting lifestyle
Diabetes	Well controlled; no complications	Poorly controlled or complications

given – and these problems may be compounded if close medical support is lacking.

Although every care must be taken to identify the medically compromised patient, it must be appreciated that the means to do so in conventional dental settings are limited and by no means always successful. It is impossible to legislate for all possibilities and there have been many cases where apparently fit people have died suddenly within a short time of being declared healthy on medical examination.

The main aims are to ensure that procedures are carried out:

- promptly but safely
- on the correct patient and at the correct site
- with minimal complications and the best possible outcome.

However, although risks arise mainly when the procedure is invasive (tissues are disrupted) and/or the patient is not healthy, they may also be a factor if health-care professionals (HCPs) are overambitious in terms of their skill or knowledge. Clinicians should work only within their field of competence. No interventional procedure is entirely free from risk but care can be improved by making an adequate assessment based on history, clinical signs and, where appropriate, investigations, and by minimizing trauma and stress to the patient (Table 2.2).

Assessment of the risks involved must include the health of the patient, which may be evaluated using a risk-stratification scoring system such as the Physical Status Classification of the American Society of Anesthesiologists (ASA) (Table 2.3). ASA I and II patients can generally be treated in general dental practice or community services. ASA III patients are often best treated in a hospital-based clinic where expert medical support is available. ASA IV and V patients are usually hospitalized or bedridden, and generally are only seeking emergency dental treatment.

Dental treatment must be significantly modified if the patient has an ASA score of III or IV, which is true of a relatively high percentage of patients aged 65–74 years (23.9%) and 75 years or over (34.9%). Controversies can arise in relation to the management of patients with ASA scores of II and III. Table 2.4 summarizes these scores for some of the more common disorders.

The Prognosis and Assessment of Risk Scale (PARS) is another assessment tool, which is virtually identical to the ASA scale but can be modified by factors such as those shown in Table 2.5; it categorizes patients into groups I–V. Other factors considered in PARS are shown in Table 2.6. The Karnofsky scale, which has been adapted for use in many areas including hospices, cancer clinics and so on, is a quick and easy way to indicate how a patient is feeling on a given day, without going through several multiple choice questions or symptom surveys (Table 2.7). The Medical Complexity classification is another available tool (Table 2.8).

Good communication is essential with both patient and other health professionals. Often, dental treatment in medically compromised patients may have to be delayed until expert advice has been sought and this is always the case for patients undergoing procedures under GA, who must be pre-assessed by the anaesthetist.

INFORMED CONSENT (OTHERWISE KNOWN AS VALID CONSENT)

The patient's autonomy must be respected at all times. Patients can determine what investigations and treatment they are or are not willing to receive. Before they are asked to make a decision, they must be given sufficient information about their condition, suggested treatment(s) (including alternative management if available), any associated risks involved in the proposed treatment, and possible outcomes if nothing is done. They have the right to refuse treatment, even if this could

Table 2.5 *Dental care modifications and the American Society of Anesthesiologists (ASA) scale and Prognosis and Assessment of Risk Scale (PARS)*

ASA	Definition	PARS	Dental care modifications
I	Normal, healthy patient	I	None
II	A patient with mild systemic disease (e.g. well-controlled diabetes, asthma, hypertension or epilepsy), pregnancy, anxiety	II	Dental care should focus on elimination of acute infection before medical/surgical procedure (e.g. prosthetic cardiac valve)
III	A patient with severe systemic disease limiting activity but not incapacitating (e.g. epilepsy with frequent seizures, uncontrolled hypertension, recent myocardial infarct, uncontrolled diabetes, severe asthma, stroke)	III	Dental care should focus on elimination of acute infection and chronic disease before medical/surgical procedure (e.g. organ transplant patients)
IV	A patient with incapacitating disease that is a constant threat to life (e.g. cancer, unstable angina or recent myocardial infarct, arrhythmia or recent cerebrovascular accident)	IV	All potential dental problems should be corrected before medical/surgical procedure (e.g. prior to radiotherapy to head and neck)
V	Moribund patient not expected to live more than 24 h with or without treatment	V	Control of acute dental pain and infection only

Table 2.6 *Prognosis and Assessment Risk Scale*

Factor	Comment
Medical status	Any complicating medical factors
Physical status	
Oral hygiene	
Psychological needs	
Functional ability	
Mental status	Level of understanding
Social environment	Support or significant events planned shortly after treatment
Family environment	
Access issues	Access to dental building, etc.
Financial issues	
Communication needs	Is an interpreter required?
Behaviour	Is behaviour management needed?
Consent	Is patient competent to give consent?

Table 2.7 *Karnofsky scale*

Score	Definition
100	Able to work. Normal, no complaints, no evidence of disease
90	Able to work. Able to carry out normal activity, minor symptoms
80	Able to work. Normal activity with effort, some symptoms
70	Independent, not able to work. Cares for self, unable to carry out normal activity
60	Disabled, dependent. Requires occasional assistance, cares for most needs
50	Moderately disabled, dependent. Requires considerable assistance and frequent care
40	Severely disabled, dependent. Requires special care and assistance
30	Severely disabled. Hospitalized, death not imminent
20	Very sick. Active supportive treatment needed
10	Moribund. Fatal processes are rapidly progressing

Table 2.8 *Medical Complexity classification*

Class	Medical condition	Status	Complications
MC-0	No significant medical problems	MC-0	No complications anticipated
MC-1	Controlled and stable condition/disease	MC-1A	No complications anticipated
		MC-1B	Minor complications anticipated
		MC-1C	Major complications anticipated
MC-2	Poorly controlled and/or unstable condition/disease	MC-2A	No complications anticipated
		MC-2B	Minor complications anticipated
		MC-2C	Major complications anticipated
MC-3	Cardiac or other conditions needing continuous monitoring		

adversely affect the outcome or result in their death. Depending on the situation, time should be allowed for the patient to think about and discuss the proposed treatment with people close to them. Consent is the expressed or implied agreement of the patient to undergo an examination, investigation or treatment. Consent is not an isolated event, but involves a continuing dialogue between clinician and patient (and occasionally their relatives or partner). In order to give informed (valid) consent, the individual concerned must have adequate reasoning faculties and be in possession of all relevant facts at the time consent is given. *Patients who undergo procedures performed without their valid consent may be entitled to claim damages in the civil courts by making a claim of negligence. The clinician is also vulnerable in the criminal courts to a charge of assault and battery following a complaint to the police by the person who received the treatment.*

Information about what the proposed investigations or treatment will involve, the benefits and risks (including adverse effects and complications), and the alternatives available is crucial for patients when they are making up their minds. The courts have stated that patients should be told about 'significant risks which would affect the judgment of a reasonable patient'.

'Significant' has not been legally defined but the General Medical Council (GMC) requires doctors to tell patients about 'serious or frequently occurring' risks. In addition, if patients make it clear that they have particular concerns about certain kinds of risk, the clinician must ensure that they are informed about these risks, even if they are very small or rare. Sometimes, patients may make it clear that they do not want any information about the options, but want the health professional to decide on their behalf. In such circumstances, ensure that the patient receives at least some very basic information about what is proposed. Where information is refused, this should be documented in the patient's notes and/or on a consent form. The important thing is for the clinician to record sufficient details of the consent process in order to be able to reconstruct the discussions and the thinking that led to a particular course of treatment in the event of a challenge at a later stage – possibly years later.

The patient's open agreement to proceed with the investigation or treatment proposed after full discussion and the patient's receipt of sufficient information is sometimes called 'informed consent'.

When obtaining consent, patients should be informed of:

- details of the diagnosis and prognosis with and without treatment
- uncertainties about the diagnosis
- options available for treatment
- the purpose of all aspects of a proposed investigation or treatment
- the likely benefits and probability of success
- any possible adverse effects and the risks of the procedure proposed
- the likelihood of one or more of the risks coming to pass
- likely outcomes if a procedure is not carried out
- the need for drains, catheters, tracheostomy, etc.
- their right to change their mind at any stage
- their right to a second opinion.

Other issues that should be discussed at this stage include:

- time of appointment or admission
- eating/starving instructions
- management of usual daily medications
- specific preoperative preparation that may be required
- transport to where the procedure will be performed
- specific anaesthetic issues
- anticipated duration of procedure
- likely recovery period
- likely discharge date
- specific postoperative care
- follow-up requirements
- anticipated date of return to full activity.

'Informed' consent means that the patient must be fully aware of the procedure, its intended benefits and its possible risks, and the level of these benefits and risks. In particular, patients must be warned about:

- preoperative preparation
- possible adverse effects
- postoperative sequelae (e.g. pain)
- where they will be during their recovery
- the possibility of intravenous infusions, catheters, nasogastric tubes, any deformity, swelling, bruising, pain, etc.

All questions should be answered honestly. Information should not be withheld that might influence the decision-making process. Patients should never be coerced. Finally, for consent to be valid, the person who obtains it must have sufficient knowledge of the proposed treatment and its risks, and should be the person who is undertaking the procedure.

At any time, the information on the form can be augmented by an additional record made in the patient's notes covering conversations, discussions or warnings.

Consent may be:

- implied (a patient lying in the dental chair with an open mouth is consenting to a dental examination).
- expressed in writing.

Although rarely a legal requirement (but frequently a contractual obligation), it is good practice to seek written consent on most occasions and this is essential where the treatment is complex or involves significant risks or adverse effects. Written consent must always be obtained from all patients having an operation. The possible benefits of the treatment must be weighed against the risks and always discussed by the person carrying out the procedure; if, for some reason, this is not possible, it must be done by a delegated person with the appropriate expertise to do so (i.e. a person who is competent to carry out the proposed surgery themselves as an independent practitioner in their own right). Written consent is also essential when provision of clinical care is not the primary purpose, the treatment is part of a project or research, or there are significant consequences for personal or social life. Your organization may have a policy setting out when you need to obtain written consent. A signature on a consent form does not itself prove the consent is valid; the point of the form is to record the patient's decision and also, increasingly, the content of the discussions that have taken place. A signed consent form is not a legal waiver; if, for example, patients do not receive enough information on which to base their decision, then the consent may not be valid, even though the form has been signed. A signed consent form will not protect the clinician if there is doubt as to whether consent was actually 'informed'. Ideally, the form should be designed to serve as an *aide-mémoire* to health professionals and patients, by providing a checklist of the kind of information patients should be offered, and by enabling the patient to have a written record of the main points discussed. However, the written information provided for the patient in no way should be regarded as a substitute for face-to-face discussions with the individual. Patients are also entitled to change their mind after signing the consent form, if they retain capacity to do so.

Although the law in relation to consent continues to evolve (as does most legislation) and there are significant variations between countries, the principles are as follows:

- Before examining, treating or caring for competent adults, consent must be obtained.
- Adults are assumed to be competent unless demonstrated otherwise.
- Patients may be competent to make some health-care decisions, even if they are not competent to make others.
- Giving and obtaining consent is usually a process, not a one-off event. *Patients can change their minds and withdraw consent at any time*.

For consent to be valid, patients must receive sufficient information about their condition and proposed treatment. It is the HCP's responsibility to explain all the relevant facts to the patient and to ascertain that they are understood. If there are doubts about their competence, the question to ask is: 'Can this patient understand, retain and then weigh up the information needed to make this decision?' If patients are not offered as much information as they reasonably need to make their decision, and in a form they can understand, their consent may not be valid. For example, information for those with visual impairment should be provided in the form of audio tapes, Braille or large print.

Patients whose first language is not English may need the help of an interpreter. Most organizations have access to experienced interpreters. It is preferable to rely on a neutral interpreter (i.e. *not* a family member) when examining and seeking consent from a patient for surgery or treatment.

Ensure the patient, staff and, where appropriate and in accordance with the patient's wishes, the patient's relatives and/or partner are kept fully informed. Maintain good, clear, contemporaneous records of the nature of all discussions that take place, including the names of those involved. Good communication and documentation can prevent future dispute and litigation. If there is any reason to believe

that consent may be disputed later, or if there are concerns about an individual's attitude or behaviour, meticulous documentation in the case notes is essential. The UK Department of Health's *Reference guide to consent for examination or treatment* (available at www.gov.uk/government/publications; accessed 30 September 2013) offers a comprehensive summary of the law on consent.

SPECIFIC CONSENT ISSUES

- No one else can make a decision on behalf of a competent adult.
- In an emergency, a life-saving procedure can be performed without consent.
- All actions must, however, be justifiable to one's peers.
- No one can give or withhold consent on behalf of a mentally incapacitated patient; decisions lie primarily with the clinicians, who should act in the patient's best interest. Where there is doubt, ultimately a court will decide on the best course of action, having taken expert advice. The Mental Capacity Act 2005 provides guidance for HCPs in England and Wales (see also The Adults with Incapacity (Scotland) Act 2000) who treat this group of patients. Guidance has been published by the UK Department of Health (Mental Capacity Act 2005 Code of Practice) and is available at http://www.dca.gov.uk/legal-policy/mental-capacity/mca-cp.pdf (accessed 30 September 2013).

Essentially, everyone aged 16 or more is presumed to be competent to give consent for themselves, unless the opposite is demonstrated.

Competent adults – namely, persons aged 16 and over who have the capacity to make their own decisions about treatment – can consent to dental treatment and they are also entitled to refuse treatment, even where it would clearly benefit their health. If a patient is mentally competent to give consent but is physically unable to sign a form, you should complete this form as usual and ask an independent witness to confirm that the patient has given consent orally or non-verbally.

If the patient is 18 or over and is not legally competent to give consent, you should use a form for adults who are unable to consent to investigation or treatment. Patients will not be legally competent to give consent if:

- they are unable to comprehend and retain information material to the decision; and/or
- they are unable to weigh and use this information in coming to a decision.

You should always take all reasonable steps (e.g. involving more specialist colleagues) to support patients in making their own decision before concluding that they are unable to do so.

Relatives *cannot* be asked to sign this form on behalf of an adult who is not legally competent to consent for him or herself, unless the patient has appointed a friend or relative to act for them, creating a lasting power of attorney (LPA). This LPA must have been created when the patient was competent and the LPA must be lodged with the Court of Protection. An LPA may allow the relative or friend to take decisions about the health of the patient, should the patient be found to be lacking capacity.

Children under the age of 16 years may also have capacity to consent if they have the ability to understand the nature, purpose and possible consequences of the proposed investigation or treatment, as well as the consequences of non-treatment. Children below 16 who have *Gillick* competence (i.e. they understand fully what is involved in the proposed procedure) may therefore consent to treatment without their parents' authority or knowledge, although their parents will ideally be involved. 'Gillick competence' is a term used in medical law to decide whether a child (16 years or younger) is able to consent to medical treatment, without the need for parental permission or knowledge:

> *As a matter of Law the parental right to determine whether or not their minor child below the age of sixteen will have medical treatment terminates if and when the child achieves sufficient understanding and intelligence to understand fully what is proposed.*

The standard is based on a House of Lords' decision in the case *Gillick v West Norfolk and Wisbech Area Health Authority* [1985] 3 All ER 402 (HL). The case is binding in England, and has been approved in Australia, Canada and New Zealand. Similar provision is made in Scotland by the Age of Legal Capacity (Scotland) Act 1991. In Northern Ireland, although separate legislation applies, the then Department of Health and Social Services Northern Ireland stated that there was no reason to suppose that the House of Lords' decision would not be followed by the Northern Ireland Courts.

Where a child under 16 years old is not deemed competent to consent, a person with parental responsibility (e.g. their legal parent or guardian, or a person appointed by the courts) has authority to consent for investigations or treatment that are in the child's best interests.

There are several legal tests that have been described in relation to consent. The *Bolam* test states that a doctor who:

> *acted in accordance with a practice accepted as proper by a responsible body of medical men skilled in that particular art is not negligent if he is acting in accordance with such a practice, merely because there is a body of opinion which takes a contrary view.*

However, a judge may, on certain rare occasions, choose between two bodies of expert medical opinion, if one is to be regarded as 'logically indefensible' (*Bolitho* principle). The main alternative to the Bolam test is the *'prudent-patient test'* widely used in North America. According to this test, doctors should provide the amount of information that a 'prudent patient' would want.

Obtaining consent from adult patients without capacity

The more elective the procedure, the more care should be taken in ensuring that the patient, parent, guardian or carer has been consulted. In true emergency situations, a dentist may rely on the best-intent principle in relation to the overall well-being of the patient, although, where there is any doubt, advice should be taken. Involve the patient as far as possible; some incapacitated patients may be quite capable of giving partial consent. Decide who else should be involved in any decision to proceed with the patient's treatment. The current position (in the UK) is that no adult can consent to the treatment of another adult (with the exception of cases that fall under the Mental Capacity Act 2005). Before anyone can give valid consent to treatment, she or he must possess the requisite capacity. The law presumes that, in the absence of evidence to the contrary, patients over the age of 16 years are capable of giving (or withholding) consent to treatment. The broad test of capacity is that the person concerned should be able

to understand the nature and purpose of the treatment and must be able to weigh the risks and benefits. They should be able to retain and weigh this information, as well as communicate their decision.

Where there is doubt, a decision has to be made as to the capacity of the patient. This presents a problem for dentists providing care for patients with learning impairment. Where the patient lacks the capacity to consent, then the dentist would normally act in the patient's best interests and treatment should not be withheld simply because consent has not been obtained, or a charge of failure in duty of care could be made. If a person is incapable of giving or refusing consent, and has not validly refused such care in advance, treatment may still be given lawfully if it is deemed to be in the patient's best interests. However, this should happen only after full consideration of its potential benefits and unwanted effects, and in consultation with the carer(s), relatives and other people close to the patient. Where treatment involves taking irreversible decisions or carrying greater risks, then the agreement of another dentist or doctor is appropriate. For those with learning difficulties, it is important to have a discussion with the parent, carer or, in their absence, two professionals who should sign their approval in the best interests of the patient. The discussions and agreement should be documented in the patient's record and, whilst this does not constitute consent, it represents good practice.

The Mental Health Act 1983 is primarily concerned with the care and treatment of people who are diagnosed as having a mental health problem which requires that they be detained or treated in the interests of their own health and safety or with a view to protecting other people.

The Mental Capacity Act 2005 applies to everyone involved in the care, treatment or support of people aged 16 years and over in England and Wales who lack capacity to make all or some decisions for themselves. This Act also applies to situations where a person may lack capacity to make a decision at a particular time due to illness, drugs or alcohol. Assessments of capacity should be time- and decision-specific. The Act clarifies the terms 'mental capacity' and 'lack of mental capacity', and says that a person is unable to make a particular decision if they cannot do one or more of the following:

- Understand information given to them
- Retain that information long enough to be able to make the decision
- Weigh up the information available to make the decision
- Communicate their decision; this could be done, for example, by talking, using sign language, or even making simple muscle movements such as blinking an eye or squeezing a hand.

A new criminal offence of ill-treatment or wilful neglect of people who lack capacity also came into force in 2007. Within the law, 'helping with personal hygiene' (that would include tooth-brushing) attracts protection from liability, as long as the individual has complied with the Act by assessing a person's capacity and acting in their best interests. 'Best-interest' decisions made on behalf of people who lack capacity should be the least restrictive of their basic rights and freedoms.

Further changes within the Act include the introduction of LPAs that extend to health and welfare decisions. When a health professional has a significant concern relating to decisions taken under the authority of an LPA that relate to serious medical treatment, the case can be referred for adjudication to the *Court of Protection*, which is ultimately responsible for the proper functioning of the legislation. The Act also created a new *Public Guardian* with responsibility for the registration and supervision of both LPAs and court-appointed deputies. Furthermore, *Independent Mental Capacity Advocates* (IMCAs) have been introduced to support particularly vulnerable incapacitated adults – most often those who lack any other forms of external support – in making certain decisions.

In Scotland, the position is complicated by the fact that the dentist has to comply with the Adults with Incapacity Act 2000. This requires the patient's doctor to issue a certificate before treatment. The document is procedure-specific and a new one is required for each treatment plan or in the event of a change to the plan. Episodes requiring GA or sedation not included in the original treatment plan will need further certification. The interesting nuance is that the dentist can assess capacity but it is the doctor who has to assess incapacity. This has created significant practical difficulties for many health-care providers.

Obtaining consent for child patients

Changing social patterns have meant that the position relating to who is able to consent to treatment for a child is no longer the same. Parental responsibility lies with the natural mother, natural father (if married to the mother at birth), adoptive parents or those who have temporary residence orders (where the child lives with them). The local authority may acquire responsibility. The natural father not married to the natural mother does *not* have parental responsibility. Parental responsibility can be granted by court order, by agreement with the mother or on her death, if stated in her will. Step-parents can be granted parental responsibility by court order.

It is important to remember that the legal situation with regard to consent varies around the world and is subject to continued debate and development.

THE USE OF RESTRAINT

Occasionally, patients may need some assistance in order to be able to undergo or cooperate with investigations or treatment. The dividing line between assistance and trespass to the person can be fine. Three forms of trespass to the person exist:

- Assault – the fear or threat of impending harm
- Battery – the unlawful application of force or unwanted touching
- False imprisonment – the infliction of restraint.

These issues must be considered carefully when the patient lacks the necessary capacity to understand the procedure being carried out. Any physical intervention is subject to the rule of 'reasonableness'. Sometimes it is necessary to control movements during operative procedures or to support an arm, for example, for the injection of intravenous drugs in order to prevent patients injuring themselves. It is wise to seek the assistance of a carer or relative at such times and to ensure that this is documented. Learning disabilities teams may be able to assist and are likely to have developed protocols and procedures to deal with such problems.

MEDICAL HISTORY

The history (or anamnesis) is the information gained by an HCP with the aim of formulating a diagnosis, providing medical care and identifying medical problems relevant to health care. The history is obtained from either the patient or people who know the patient and can provide the necessary information. History-taking also allows the HCP to develop rapport with the patient, place the diagnosis in the context of the patient's life, identify relevant physical signs, and assess mental state and attitude towards health care. Age and cultural factors may also be important (Appendices 2.1 and 2.2). Due cognisance must be taken of a person's "protected characteristics", of which there are nine (Table 2.9).

Table 2.9 *Protected characteristics*

Age	Where this is referred to, it refers to a person belonging to a particular age (e.g. 32 year olds) or range of ages (e.g. 18–30 year olds).
Disability	A person has a disability if s/he has a physical or mental impairment which has a substantial and long-term adverse effect on that person's ability to carry out normal day-to-day activities.
Gender reassignment	The process of transitioning from one gender to another.
Marriage and civil partnership	Marriage is defined as a 'union between a man and a woman'. Same-sex couples can have their relationships legally recognised as 'civil partnerships'. Civil partners must be treated the same as married couples on a wide range of legal matters.
Pregnancy and maternity	Pregnancy is the condition of being pregnant or expecting a baby. Maternity refers to the period after the birth, and is linked to maternity leave in the employment context. In the non-work context, protection against maternity discrimination is for 26 weeks after giving birth, and this includes treating a woman unfavourably because she is breastfeeding.
Race	Refers to the protected characteristic of Race. It refers to a group of people defined by their race, colour, and nationality (including citizenship), ethnic or national origins.
Religion and belief	Religion has the meaning usually given to it but belief includes religious and philosophical beliefs including lack of belief (e.g. Atheism). Generally, a belief should affect your life choices or the way you live for it to be included in the definition.
Sex	A man or a woman.
Sexual orientation	Whether a person's sexual attraction is towards their own sex, the opposite sex or to both sexes. http://www.equalityhumanrights.com/advice-and-guidance/new-equality-act-guidance/protected-characteristics-definitions/

Box 2.2 *Corah dental anxiety scale*

If you had to go to the dentist tomorrow, how would you feel about it?

- I would look forward to it as a reasonably enjoyable experience
- I wouldn't care one way or the other
- I would be a little uneasy about it
- I would be afraid that it would be unpleasant and painful
- I would be so anxious that I might break out in a sweat or almost feel physically sick

When you are waiting in the dental surgery for your turn in the chair, how do you feel?

- Relaxed
- A little uneasy
- Tense
- Anxious
- So anxious that I sometimes break out in a sweat or almost feel physically sick

When you are in the dentist's chair waiting while the drill is prepared to begin work on your teeth, how do you feel?

- Relaxed
- A little uneasy
- Tense
- Anxious
- So anxious that I sometimes break out in a sweat or almost feel physically sick

You are in the dentist's chair to have your teeth cleaned. While you are waiting and the dentist is getting out the instruments for scraping your teeth around the gums, how do you feel?

- Relaxed
- A little uneasy
- Tense
- Anxious
- So anxious that I sometimes break out in a sweat or almost feel physically sick

It may occasionally be helpful to carry out a formal assessment of the patient's feelings about health care, and tools such as the Corah anxiety scale are available for this (Box 2.2; Ch. 10).

When taking a history, a structured guide such as that shown in Box 2.3 should be followed. Patients should also be given a form on which to supply all the information they can about their health and any medication they are receiving. Medical and drug history should be regularly updated at subsequent dental visits. *Remember that all such information is confidential.*

Box 2.3 *Essentials of history-taking*

- Personal details
- Presenting complaint (PC)
- History of presenting complaint (HPC)
- Relevant medical history (RMH)
- Drug history
- Social history
- Family history

PERSONAL DETAILS

The patient's personal details include age, sex, educational status, religion or faith, occupation, relationship status, address and contact details. This information is necessary for administrative purposes and, since the questions are largely non-threatening, this stage provides a gentle introduction into the meeting of patient and clinician, in a format that can be individualized to suit a particular culture.

PRESENTING COMPLAINT

This should be recorded in the patient's own words (e.g. 'pain in my face').

HISTORY OF PRESENTING COMPLAINT

The timing of the complaint and its evolution should be elicited. If the patient has pain, a useful mnemonic is 'SOCRATES': S – site, O – onset (gradual/sudden), C – character, R – radiation, A – associations (other symptoms), T – timing/duration, E – exacerbating and alleviating factors, S – severity (pain rated on a visual analogue scale of 1 [minimal] to 10 [unbearable]).

RELEVANT MEDICAL HISTORY

This includes any past medical and surgical problems. Patients should be asked if they carry a medical warning card or device and careful note should be taken of it, particularly in respect of allergies, a bleeding disorder, cardiac disease or diabetes (see, for example, Medic-Alert and Talisman; Figs 2.1–2.3). Patients increasingly wear wristbands and bracelets that show the major medical issues they face. These may be seen clearly in writing; available electronically with bar codes or QR codes; supplied on a USB stick; or provided on a chip that is available for electronic scanning with a sensor (Fig. 2.4).

Fig. 2.1 Medic-Alert bracelet. The patient's main diagnosis or drug treatment is engraved on the reverse, together with the telephone number of the company that holds details of the medical history.

Fig. 2.2 Diabetes alert necklace.

Fig. 2.3 Talisman warning emblem.

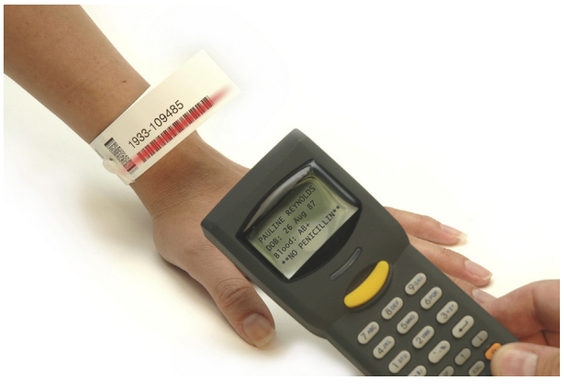

Fig. 2.4 Electronic reading of medical data. (Courtesy of Google).

Box 2.4 *Review of systems (see Table 2.10)*

- Allergies
- Bleeding disorders
- Cardiorespiratory disorders
- Drug treatment
- Endocrine disorders
- Fits or faints
- Gastrointestinal disorders
- Hospital admissions and attendances
- Infections
- Jaundice and liver disease
- Kidney and genitourinary disorders
- Likelihood of pregnancy
- Mental state
- Neurological problems

The completion of a medical history form provides a useful basis for the dental professional to enquire further, and the following chapters describe in more detail the nature and relevance of any diseases that are mentioned. The completion of such a form and appropriate response to its contents also constitute useful evidence when the clinician is faced with any medico-legal claims. The medical history is crucial but has limitations, not least because patients may be confused or ill informed. *The history may also change radically with time, so it is essential for it to be updated before each new course of treatment and every sedation session, and especially before surgery or GA.* For example, patients not pregnant at one course of treatment could well be by the next. One study followed a small group of middle-aged and older dental patients, and found that nearly 20% developed significant medical disorders (mostly cardiovascular) over a period of 5 years.

Functional enquiry or review of systems (ROS) helps disclose undeclared medical problems. Patients should be asked specifically about their conditions; Box 2.4 offers an alphabetical list that is easy to recall.

The relevance of the main points from the history is shown in Table 2.10. It may also be necessary to enquire about constitutional symptoms (e.g. fever, weight loss, night sweats, fatigue/malaise/lethargy, sleeping pattern, appetite, fever), musculoskeletal conditions (pain, stiffness, swelling of the joints), and rash, blistering or lumps (Figs 2.5–2.8).

DRUG (MEDICATION) HISTORY

Enquire whether the patient has any allergies, and ask for a description of any reactions that have occurred.

Often, a medical problem is revealed only after a drug history has been elicited, but some patients may be unaware of the name of, or reason for taking, their medication. Multiple drug use is common in older people with complex medical histories (Figs 2.9–2.11). Sometimes, the nature of the drug used may be suggested by the name (Table 2.11). Ask the patient if they are taking any prescription-only medication (POM; this may be tablets, injections, patches or inhalers) and also any over-the-counter (OTC) medications, including herbal preparations. Some of these can influence health care.

SOCIAL HISTORY

Enquire tactfully about occupation, marital status, partner's job and health, housing, dependants, mobility, lifestyle habits (alcohol,

Table 2.10 *Relevance of medical history to dentistry*

Condition	Main features	Other comments	Relevance in dentistry
Allergies	Range from urticaria to anaphylaxis	Rashes? Racial origins may be important, especially in the case of drug reactions. Carbamazepine-induced Stevens–Johnson syndrome is strongly associated with HLA-B1502 in Han Chinese, Hong Kong Chinese, Thais and Indians, and HLA-A3101 in Northern Europeans	Common allergies relate to latex, iodine, Elastoplast® and drugs (hence acronym 'LIED'). Anaesthetics, analgesics (e.g. aspirin or codeine) and antibiotics (e.g. penicillin) are main offending drugs
Bleeding disorders	Bleeding and/or bruising	Haematological/lymphatic: lymph node swelling? Bleeding or bruising? History of involvement of other family members or of admission to hospital for control of bleeding is particularly important	Significant hazard to surgery
Cardiorespiratory disorders	Wheezing, cough, dyspnoea, chest pain, swelling of ankles, palpitations, hypertension	Chest pain? Shortness of breath? Exercise tolerance? Orthopnoea? Oedema? Palpitations? Cough? Sputum? Wheeze? Haemoptysis? Patient's ability to climb 15–20 stairs without pain, dyspnoea or tiredness may indicate degree of fitness of cardiorespiratory system	Often a contraindication to GA or CS
Drug treatment	Obtaining useful answers about drug treatment, including over-the-counter medications, will necessitate asking: 'Do you ever have any injections or take drugs, pills, tablets, medicines or herbal preparations of *any* kind?'	Drug use may be only indication of serious underlying disease. Corticosteroids, antihypertensives, anticonvulsants, anticoagulants, antibiotics, insulin and oral hypoglycaemics are all important in this respect	Most serious drug interactions are with GA agents (intravenous or inhalational), monoamine oxidase inhibitors and antihypertensive drugs. Aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs) may be a hazard in anticoagulated, asthmatic, diabetic or pregnant patients, those with peptic ulcer, or children under 16 y. If patient does not know name of medicines, defer treatment until drug is identified by patient's doctor, Drugs Information Unit or pharmacy, or by checking *Monthly Index of Medical Specialties* (MIMS), *Physicians' Desk Reference* (PDR) or *British National Formulary* (BNF)
Endocrine disorders	Diabetes mellitus may lead to collapse	Diabetes: irritability, aggression, lassitude, anorexia, weight loss Hyperthyroidism: heat intolerance, emotional lability, sweating, diarrhoea, oligomenorrhoea, weight loss despite increased appetite, tremor, palpitations, visual disturbances Hypothyroidism: dislike of cold weather, lethargy, tiredness, depression, dry skin and hair, hoarseness, menorrhagia, constipation Hyperadrenocorticism: weight gain and redistribution, moon face, hirsutism, skin striae, purpura Hypoadrenalism: weakness, weight loss, hypotension, pigmentation	Hypoglycaemia is main problem
Fits or faints	History of fits or faints	Type? Frequency? Precipitating factors? Awareness may allow preventive measures to be instituted	Fainting, epilepsy and other causes of loss of consciousness can disrupt dental treatment and may result in injury to patient
Gastrointestinal disorders	Abdominal pain, frequency and type of stool, bleeding and weight loss	Difficulty swallowing? Indigestion? Nausea/vomiting/haematemesis? Bowel habit? Faecal colour, consistency, blood (or melaena), smell, difficulty flushing away, tenesmus (feeling of incomplete evacuation) or urgency?	Crohn disease or coeliac disease may lead to oral complications, and gastric disorders may increase risk of vomiting during GA
Hospital admissions and attendances	Hospital admissions may also indicate underlying disease, and past operations may suggest possibility of future complications that can influence dental treatment		A history of operations may provide knowledge of possible reactions to GA and surgery. A patient who has had a tonsillectomy, for example, without complications is most unlikely to have a congenital bleeding disorder. Retinal operations, since they may use intraocular gases, may be a contraindication to GA or relative analgesia, which may cause rapid expansion of ocular gas and lead to blindness

(*Continued*)

Table 2.10 (Continued)

Condition	Main features	Other comments	Relevance in dentistry
Infections	Various, possibly rashes and/or fever	Ever attended a clinic for sexually shared infections (SSIs), or been admitted to hospital for an infection, or been accepted or refused for blood donation? Men who have sex with men, abusers of intravenous drugs and patients who have attended SSI clinics are more likely to have a history of infection with human immunodeficiency virus (HIV), hepatitis viruses, herpes simplex, syphilis, gonorrhoea and many other infections (Ch. 21)	The possibility of transmission of infections and their sequelae must be considered. Carriers of meticillin-resistant *Staphylococcus aureus* (MRSA) may be a hazard to others; carriers of *Neisseria meningitides* may be sources of meningitis outbreaks
Jaundice and liver disorders	A history of jaundice may imply carriage of hepatitis viruses, although jaundice is a clinical sign of other underlying liver diseases		Liver disease can lead to prolonged bleeding and impaired drug metabolism can result (Ch. 9). Jaundice after an operation may have resulted from halothane hepatitis and, if this is suspected, a different general anaesthetic, such as isoflurane, desflurane or sevoflurane, should be given
Kidney and genitourinary disorders	Manifestations of chronic kidney disease may include hypertension, pallor and bruising	Incontinence (stress or urge), dysuria (pain), haematuria, nocturia, frequency, polyuria, hesitancy, terminal dribbling? Vaginal discharge?	Can affect dental management, as excretion of some drugs is impaired. Tetracyclines should be given in lower doses. Complications of renal failure or transplants can produce oral signs
Likelihood of pregnancy		Menses (periods) – frequency, regularity, heaviness, duration, painfulness? First day of last menstrual period (LMP)? Number of pregnancies and births? Menarche? Menopause? Any chance of pregnancy now? Which trimester?	Any essential procedures involving drugs (even aspirin), radiography or GA should be arranged during middle trimester
Mental state	Behavioural changes	Appearance and behaviour; thought (speech) form, rate, quantity, pattern, flight of ideas, loosening of associations; mood (subjective); affect (observed); thought content, preoccupations, obsessions, overvalued ideas, ideas of reference, delusions; suicidality; abnormal experiences, hallucinations, passivity, thought interference; cognition; consciousness; attention/concentration; memory; orientation; intelligence; executive function; insight. It may sometimes be useful to assess degree of patients' anxiety in a relatively objective way by using Corah dental anxiety scale (see Box 2.2)	Anxiety is inexorably associated with attending for dental treatment. Anxious patients may sometimes react aggressively and anxiety may limit extent of dental treatment that can be provided under LA
Neurological problems		Special senses – any changes in sight, smell, hearing and/or taste? Seizures, faints, fits, funny turns? Headache? Pins and needles (paraesthesiae) or numbness? Limb weakness, poor balance? Speech problems? Sphincter disturbance?	Movement disorders can significantly disrupt operative procedures. Access can be a barrier to care

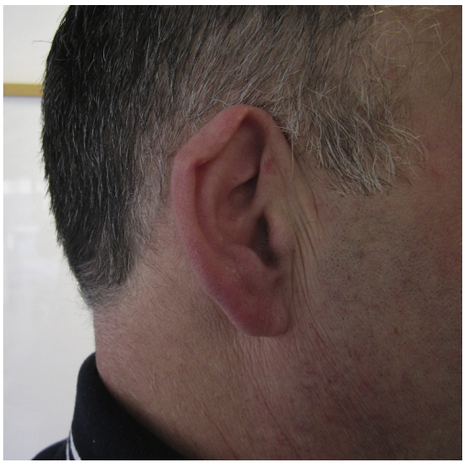

Fig. 2.5 'Boxer's ear', showing distortion.

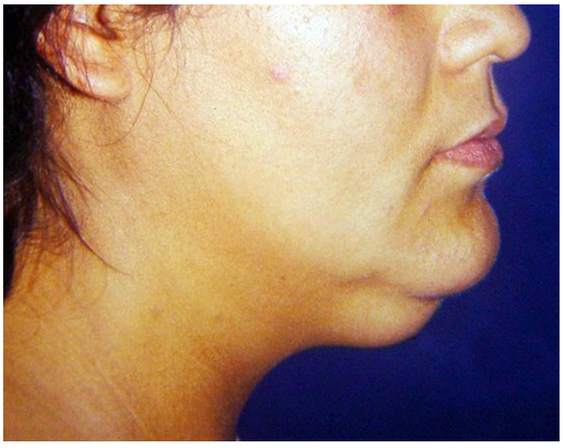

Fig. 2.6 Cyst in submental region.

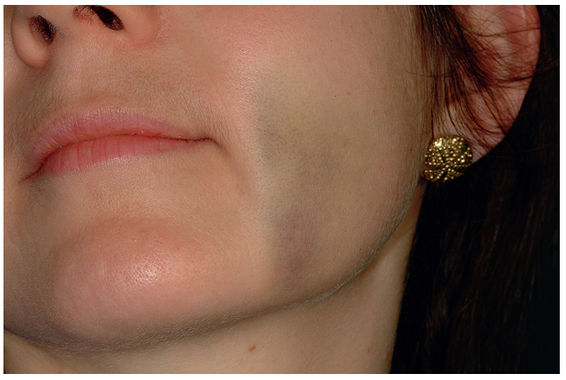

Fig. 2.7 Facial bruising.

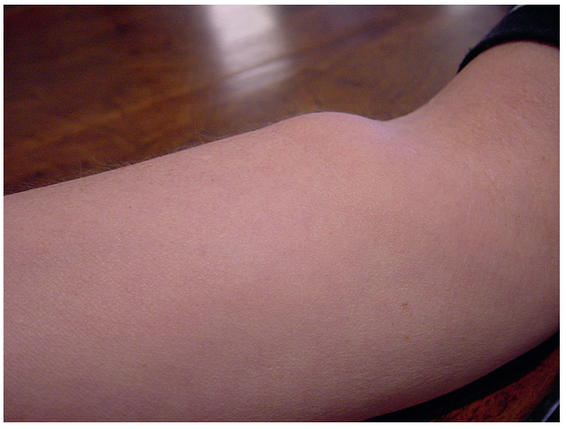

Fig. 2.8 Lipoma.

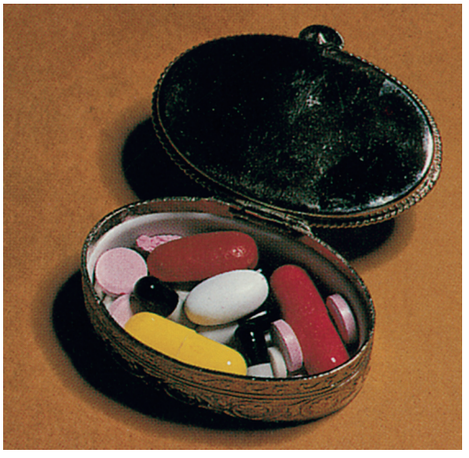

Fig. 2.9 Pill box presented by an outpatient who proved to be taking eight different medications daily, including a corticosteroid.

tobacco, betel, etc., and recreational drugs), culture and faith. Any social or religious engagements that are dependent on the patient being unimpeded following an elective treatment (wedding, examination, job interview) need discussion and possibly the treatment should be rescheduled; see also Chapters 25, 28 and 30.

FAMILY HISTORY

The medical history of blood relatives may be very informative.

Fig. 2.10 Manual organizer for multi-drug therapy.

Fig. 2.11 Digital organizer for multi-drug therapy. (Courtesy of Google).

CLINICAL EXAMINATION

It is important for dental professionals not merely to inspect and examine the mouth and neck, but also to inspect the exposed areas of the patient (the face, neck, arms and hands). The patient's appearance, behaviour, speech and body language can reveal many significant conditions (Fig. 2.12). However, it must be stressed that even very ill patients can look remarkably well. A search should be made for such readily visible signs as anxiety, movements, tremors, dyspnoea, wheezing and tiredness, and also for changes in the face (e.g. expression, pallor, cyanosis or jaundice), neck (e.g. lumps) or hands (e.g. finger clubbing, Raynaud phenomenon, rashes).

Facial movement and sensation should be assessed in the course of testing the cranial nerves (Ch. 13). Eyes and ears should be observed and examined (Fig. 2.13). Maxillary, mandibular or zygomatic deformities or swellings may be more reliably confirmed by inspection from above (maxillae, zygomas) or behind (mandible). The degree and direction of opening of the mandible should be assessed; this can be disturbed in temporomandibular joint (TMJ) disease and

Table 2.11 *Drug names and possible identification*

Drugs ending in …	Possible type of drug[a]
-am	Benzodiazepines
-ase	Fibrinolytics
-apine	Antipsychotics
-asone/one	Corticosteroids
-azine	Antipsychotics
-azole	Azole antifungals
-azosin	α-adrenoreceptor blockers
-cillin	Penicillins
-cin	Some antimicrobials
-coxib	Newer non-steroidal anti-inflammatory drugs (NSAIDs)
-cycline	Tetracyclines
-dopa	Antiparkinsonian agents
-dronate/dronic	Bisphosphonates
-erol	β_2 agonists (used for asthma)
-fibrate	Fibrates
-gatran	Newer oral anticoagulants (NOACs)
-imab/umab	Monoclonal antibodies (MoAbs)
-ipine	Calcium-channel blockers
-lukast	Leukotriene-receptor antagonists
-navir	Protease inhibitors (PIs)
-nitrate	Nitrates
-olol	Beta-blockers
-ovir	Antivirals
-parin	Heparins
-prazole	Proton-pump inhibitors (PPIs)
-pril	Angiotensin-converting enzyme inhibitors (ACEIs)
-relin	Gonadorelin analogues
-salazine	Salicylate derivatives
-sartan	Angiotensin-receptor antagonist
-setron	$5HT_3$ antagonists
-statin	Statins
-terol	β_2-adrenergic agonist
-tidine	H_2-receptor antagonists
-triptan	$5HT_1$ agonists
-tropium	Antimuscarinic bronchodilators
-vudine	Nucleoside reverse transcriptase inhibitors (NRTIs)

[a]Always check in *British National Formulary* (BNF).

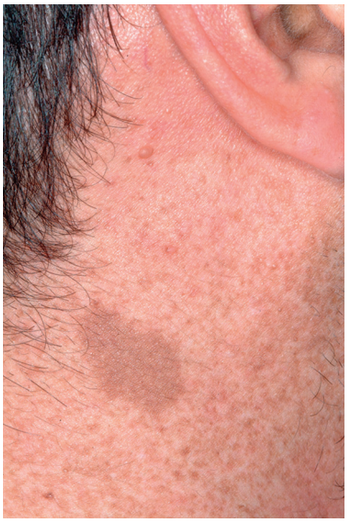

Fig. 2.12 Café-au-lait patch indicative of neurofibromatosis.

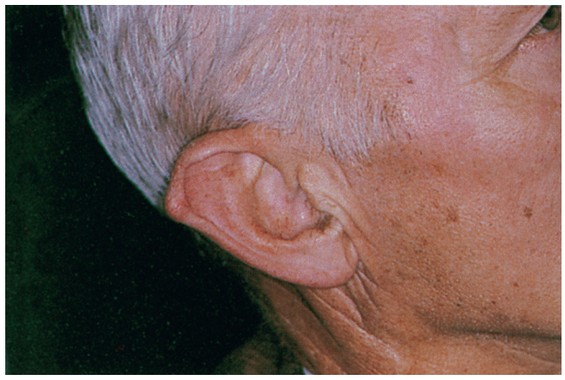

Fig. 2.13 Gouty tophi.

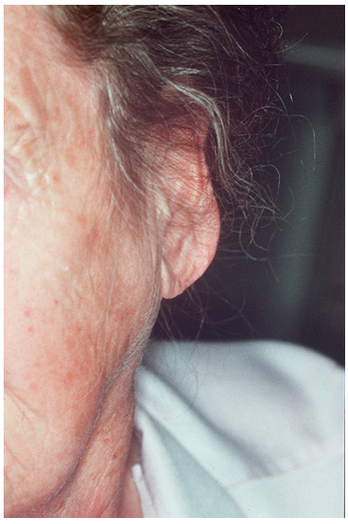

Fig. 2.14 Salivary gland swelling.

other conditions causing restricted mouth-opening (trismus) discussed in Chapter 4.

Inspection of the major salivary glands may reveal swelling of the parotid gland, which causes outward deflection of the lower part of the ear lobe, best observed by looking at the patient from behind (Fig. 2.14).

Examination of the neck is crucial. The patient should be observed from the front but also the neck should be palpated, as swollen lymph nodes are sometimes a sign of disease (Fig. 2.15). One-third of the body's lymph nodes are in the neck.

Hands can show a number of features. Deformities can be seen in arthritis (Fig. 2.16). Palmar erythema may occur in liver disease and rheumatoid arthritis. Finger-clubbing may be congenital or is seen in cardiorespiratory disease and liver cirrhosis. Koilonychia (spoon-shaped nails) is seen in iron deficiency; leukonychia (white nails) in liver cirrhosis; nail defects in lichen planus (Fig. 2.17), chronic candidosis and psoriasis; nail haemorrhages in infective endocarditis; and pigmentation in drug use (e.g. zidovudine; Fig. 2.18). Raynaud phenomenon can be a feature of connective tissue disorders. Finger-joint deformities can occur in rheumatoid arthritis. Dupuytren contracture (Ch. 4) may be seen in alcoholic cirrhosis and muscle contractures in cerebral palsy.

Hair can show features in several conditions. Alopecia may be autoimmune, may be seen in lichen planus, or may occur after radiation.

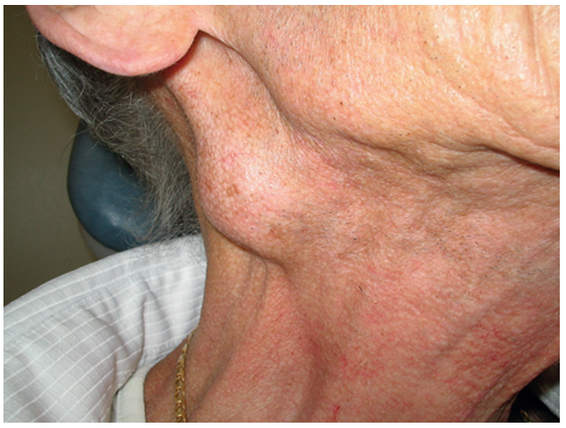

Fig. 2.15 Cervical lymphadenopathy.

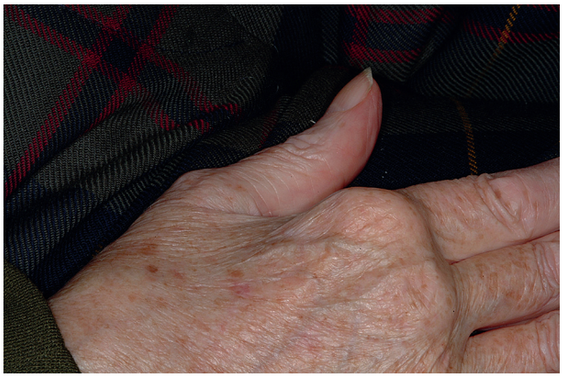

Fig. 2.16 Arthritis.

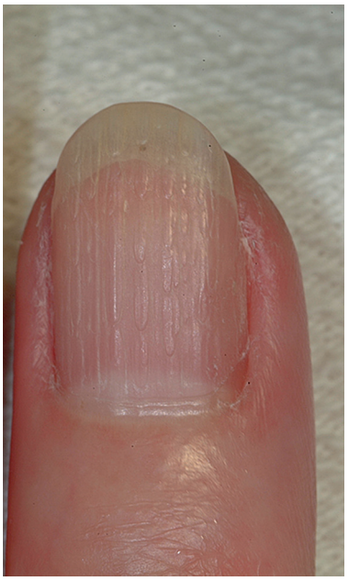

Fig. 2.17 Lichen planus nail deformity.

Hirsutism is a feature of adrenogenital syndrome or Cushing disease, or may be caused by ciclosporin, corticosteroids, minoxidil, phenytoin or androgenic steroids.

The face may be unusual in many syndromes, such as Down syndrome or mucopolysaccharidoses. It may exhibit bruising from trauma

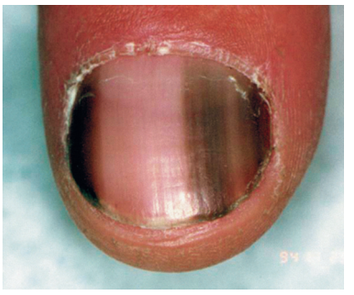

Fig. 2.18 Nail discolouration may be seen after trauma or in local disease, such as fungal infections, in drug use (as here) or in systemic disease.

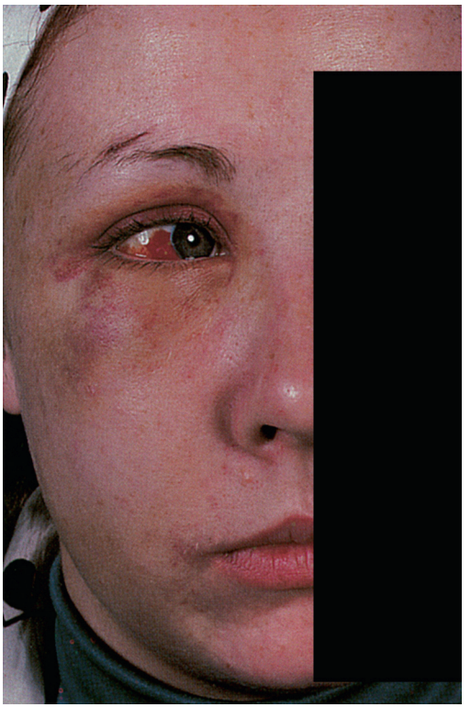

Fig. 2.19 Subconjunctival haemorrhage associated with zygomatic fracture.

(Fig. 2.19) or purpura; cushingoid facies due to Cushing disease or corticosteroid treatment; and a mask-like facies in scleroderma. Facial telangiectasia is seen in hereditary haemorrhagic telangiectasia, cirrhosis and CREST (*c*alcinosis, *R*aynaud, o*e*sophageal dysfunction, *s*cleroderma, *t*elangiectasia) syndrome. Facial palsy may indicate stroke or Bell palsy. Neurofibromatosis (Fig. 2.20), tumours (Fig. 2.21) and cysts (Fig. 2.22) may present as lumps. Infection may cause swelling (Fig. 2.23). Myxoedema may indicate hypothyroidism. 'Butterfly rash' over the face may indicate systemic lupus erythematosus, while angiofibromas may underlie tuberous sclerosis (epiloia; Fig. 2.24). A malar flush can be seen in mitral valve stenosis, xanthelasmas in hyperlipidaemia, and cyanosis in hypoxia – cardiac or respiratory disease. Pallor is seen in anaemia or before an imminent faint; purpura may occur in thrombocytopenia or trauma; hyperpigmentation can be racial, or due to suntan, Addison disease or chronic drug (e.g. phenothiazine) use; and hypopigmentation can be caused by vitiligo (Fig. 2.25).

Eyes may show features of disease. Exophthalmos can be seen in hyperthyroidism, and ptosis in myopathy and Horner syndrome. Blue sclerae can be features of infancy and osteogenesis imperfecta.

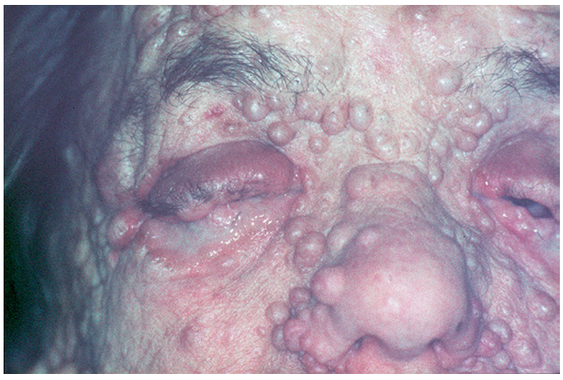

Fig. 2.20 Neurofibromatosis.

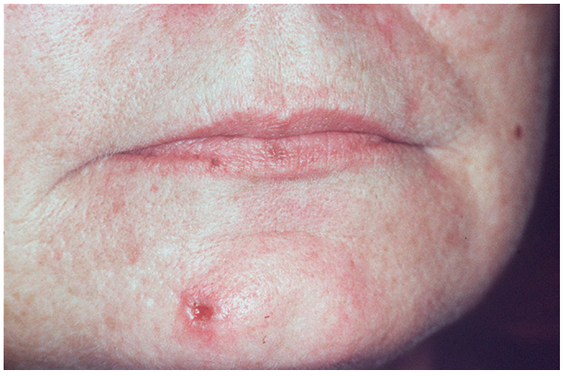

Fig. 2.21 Basal cell carcinoma.

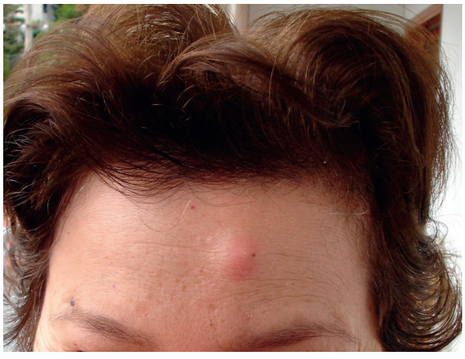

Fig. 2.22 Sebaceous cyst.

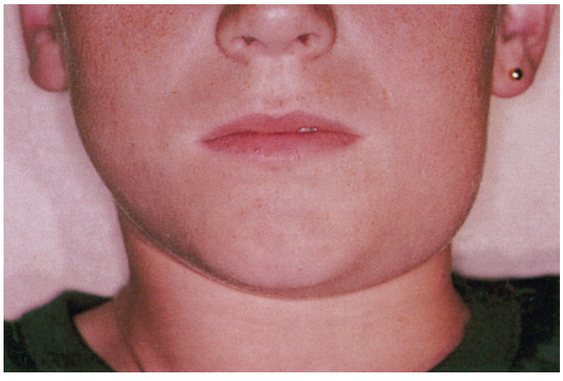

Fig. 2.23 Cat scratch disease.

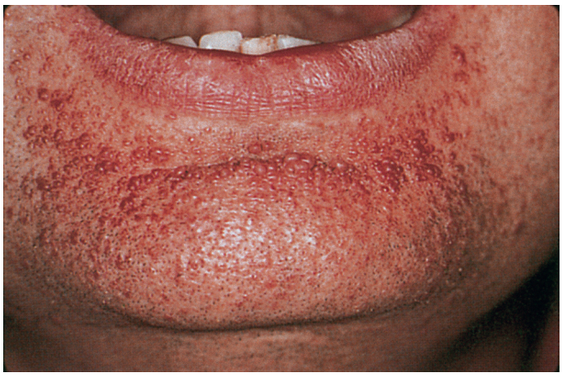

Fig. 2.24 Tuberous sclerosis showing adenoma sebaceum.

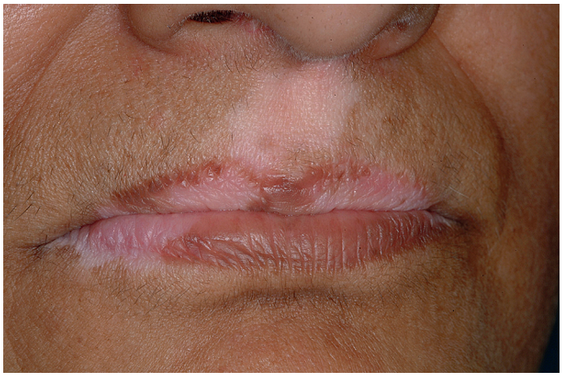

Fig. 2.25 Vitiligo.

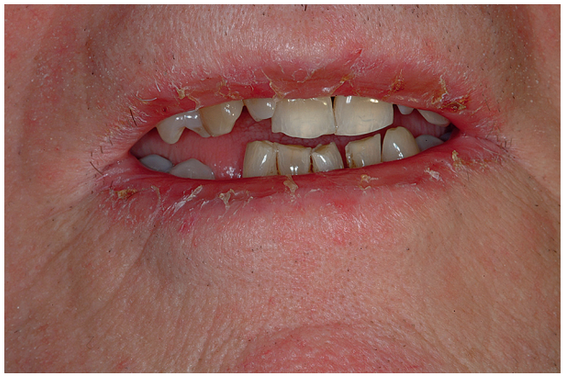

Fig. 2.26 Exfoliative cheilitis.

Conjunctival haemorrhage can indicate trauma, fractured zygoma or purpura. Jaundice can imply liver disease.

The lips can show cheilitis (e.g. factitious; Fig. 2.26), lichen planus (Fig. 2.27) or erythema multiforme. Angular stomatitis can be associated with denture-related stomatitis, anaemia, haematinic deficiency, diabetes, human immunodeficiency virus (HIV) and other diseases (Fig. 2.28). Lip swelling may be seen after trauma and in infections, neoplasms, allergies, Crohn disease, sarcoidosis or angioedema. Lip pigmentation may underlie Peutz–Jeghers syndrome. 'Hanging jaw' is a feature of myasthenia gravis.

Lumps may indicate neoplasms (Fig. 2.29). *Salivary gland* swellings can represent mumps, Sjögren syndrome, sialosis or tumour (Ch. 4).

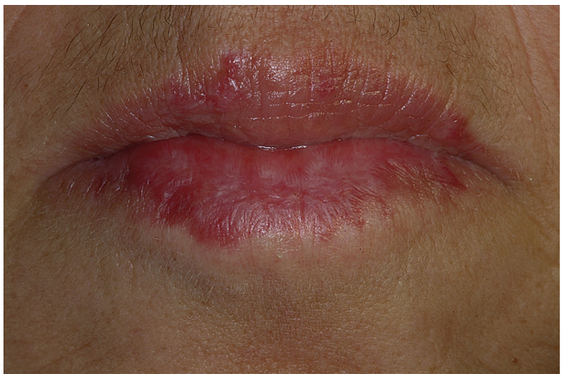

Fig. 2.27 Lichen planus on lips.

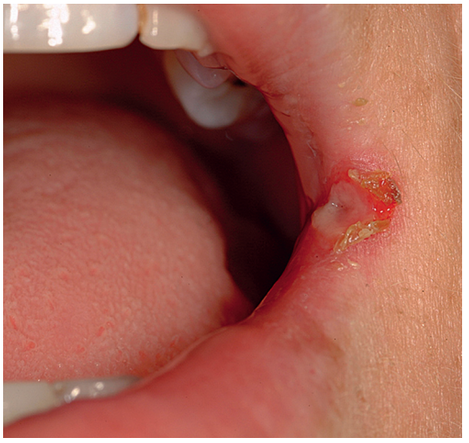

Fig. 2.28 Angular stomatitis.

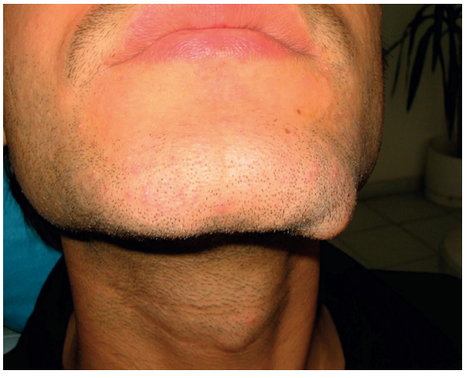

Fig. 2.29 Osteoma.

Jaw prognathism and thickened facies can be features of acromegaly. *Cervical lymph node* enlargement is seen in HIV and other infections, malignancy and leukaemia.

Loss of weight or emaciation can be features of anorexia, malignant disease, tuberculosis or HIV infection.

Speech disturbances may suggest drug intoxication, hyposalivation, learning disorder, and neurological or muscle diseases.

Inpatients must always have a full physical examination before an operation, which may include inspection, palpation, percussion and auscultation, and covers examination of at least the following systems:

- Lymph nodes
- Cardiovascular – pulse, blood pressure, heart sounds
- Respiratory – respiratory rate, lung expansion, tracheal position, lung sounds
- Gastrointestinal – any swelling or restriction of movement or tenderness, together with palpation for masses and tenderness
- Neurological – especially the cranial nerves.

Most evidence shows that the history and physical examination often reveal most, if not all, of the clinically useful data. Before any investigations are initiated, the patient's consent must be obtained. Confidentiality must be respected; the history, examination and investigation findings should not be divulged except when there is expressed consent.

INVESTIGATIONS

Investigations are useful only when the appropriate tests are requested, and interpreted in the light of the history, clinical findings, knowledge and experience. It is useless and potentially dangerous to request investigations, the results of which will have no influence on the diagnosis or management.

Screening for latent medical problems is *sometimes* appropriate, mainly when effective action can be taken on the basis of the results. Several relevant treatable conditions, particularly hypertension and diabetes, are frequently unsuspected. For example, blood and urine glucose levels may be abnormal in 5% or more of dental patients. However, it is important not to undertake testing that may cause unnecessary anxiety, trauma, delay or expense.

Many studies have shown the *disadvantages* of 'routine' and 'screening' tests, even preoperatively, carried out with little focus; too often, trivial or inexplicable findings are revealed and unnecessary anxiety and stress caused.

PREOPERATIVE TESTS

Preoperative tests may provide information to reduce possible harm or increase benefit to the patient by altering surgical or sedation/anaesthetic management, and may help risk assessment and guide discussion with the patient that is relevant to informed consent. They may predict postoperative complications and establish a baseline measurement for later reference. Before any investigation is requested, however, it is important for there to be a high enough likelihood of finding an abnormal result and for an abnormal result genuinely to change the patient's management. Most preoperative tests (typically, a full blood count, prothrombin time [PT] or international normalized ratio [INR], activated partial thromboplastin time [APTT], basic metabolic panel and urinalysis) performed on elective surgical patients prove to be normal: findings influence management in under 3% of patients tested. In almost all cases, no adverse outcomes are observed when clinically stable patients undergo elective surgery, irrespective of whether an abnormal test is identified. Preoperative testing is appropriate in symptomatic patients and those with risks factors for which diagnostic testing can provide clarification of a patient's surgical risk. The National Institute for Health and Care Excellence (NICE; formerly the National Institute for Health and Clinical Excellence) guidelines are generic and lack consensus (http://publications.nice.org.uk/preoperative-tests-cg3; accessed 25 May 2013); hospitals may have their own guidelines and individual clinicians remain ultimately responsible.

Table 2.12 *Grades of surgery*

Grade	Examples of procedures
1	Excision of lumps and bumps, incision of abscesses, tooth removal
2	Arthroscopy, herniorrhaphy, tonsillectomy, varicose veins
3	Hysterectomy, thyroidectomy, endoscopic prostatectomy
4	Major bowel, head and neck, lung and joint surgery, and joint replacement Neurosurgery Cardiovascular surgery

(adapted from NICE).

For the purpose of preoperative tests, NICE categorizes surgical procedures into four grades on the basis of complexity and physiological insult (Table 2.12).

The NICE recommendations are in the form of 'look-up' tables set out by surgery grade and ASA grade (http://www.nice.org.uk/nicemedia/live/10920/29090/29090.pdf; accessed 30 September 2013):

- Plain chest X-ray (radiograph)
- Resting electrocardiogram (ECG)
- Full blood count
- Haemostasis – including PT, APTT and INR
- Renal function – including tests for potassium, sodium, creatinine and/or urea levels
- Random blood glucose
- Urine analysis (urine dipstick tests – test for pH, protein, glucose, ketones, blood/haemoglobin).

There are also recommendations for sickle cell test and pregnancy tests, and:

- blood gases – for ASA grades II and III only
- lung function (peak expiratory flow rate, forced vital capacity and forced expiratory volume) – for ASA grades II and III only.

Chest radiograph (X-ray)

The likelihood of identifying undiagnosed cardiorespiratory disease and the desirability of re-evaluating patients with known conditions need to be balanced against the radiation exposure. In general, ASA I patients do not require preoperative chest X-rays (CXRs), with the *possible* exception of smokers over the age of 60 who are undergoing grade 3 or 4 surgery. Certain types of surgery *may* warrant a CXR at some point in the patient's work-up (e.g. cardiothoracic, oesophageal, and major head and neck surgery). ASA III patients with cardiovascular disease undergoing anything more than grade 1 surgery should probably have a CXR. This should not be repeated if one has been done within 6 months unless the patient's symptoms or signs have changed; in many cases, it could be argued that echocardiography provides more useful information and avoids radiation exposure. Respiratory disease that has changed in its nature or severity with time is a probable indication for CXR, with the exception of patients between the ages of 16 and 40 undergoing grade 1 surgery.

Electrocardiogram

An electrocardiogram (ECG) may on occasion provide evidence of asymptomatic cardiovascular disease and, in those with known cardiac disease, is useful in estimating risks of GA and surgery. An ECG should be obtained for smokers, for patients with a history or symptoms of cardiac, respiratory or renal disease undergoing grade 4 surgery, and for all patients over the age of 60, regardless of the grade of surgery.

Full blood count (full blood picture)

Full blood count (FBC) may identify and quantify pre-existing anaemia and help assessment of the patient's likely tolerance of any blood loss. FBC is probably indicated in all patients undergoing grade 3 or 4 surgery, particularly in patients with cardiovascular or respiratory disease, for all patients with renal disease, and for all patients over 60 undergoing grade 2 surgery. The white cell count (WCC) may be useful if infection is suspected, and the platelet count where there is suspicion or a history of bleeding tendency.

Haemostasis tests

Haemostatic tests include the platelet count, PT, INR and APTT (Ch. 8). Indications for such tests preoperatively are patients taking anticoagulants; those on haemodialysis; those with a past history or family history of abnormal bleeding, bruising, or liver, kidney or vascular disease; before surgery with the potential to cause a large blood loss so that the need for transfusion is likely; before surgery for cancer, especially where liver metastases may have resulted in a bleeding tendency; and before arterial reconstructive surgery. Investigations should also be considered when regional anaesthesia is planned, particularly using spinal and epidural techniques.

Renal function tests (urea and electrolytes)

Renal function should be assessed in all patients with known renal disease, diabetes, liver dysfunction, and those with an ileus, who are parenterally fed or who are likely to have intravenous fluid administration and perioperative fluid loss.

All adults and children should have urea and electrolyte tests (U&Es) before grade 4 surgery (U&Es are otherwise not generally required in children). These tests are needed in all adults of ASA III or those undergoing grade 3 surgery. Older patients may have asymptomatic deteriorating renal function, so U&Es should be obtained for those aged 60 and over, and before grade 3 surgery. In patients with cardiovascular disease, U&Es are needed in those aged 60 and over undergoing grade 2 surgery.

Sickle test

A sickle test should be requested for all patients of African and West Indian origin, and probably also for those of Mediterranean and Indian origin.

IMAGING

X-RAYS (RADIOGRAPHY)

Radiography, fully discussed elsewhere (see https://www.gov.uk/government/publications/the-ionising-radiation-medical-exposure-regulations-2000), is particularly helpful diagnostically since it is inexpensive, rapidly achieved and widely available. Conventional radiography is useful for imaging: bone and joint disease, fractures and dislocations, antral and dental disease (Table 2.13). Plain X-rays have a relatively low radiation dose and special procedures can achieve soft-tissue imaging, albeit with a higher radiation dose.

Table 2.13 *Radiographs recommended for demonstrating various head and neck sites*

Region required	Standard views	Additional views
Skull[a]	Postero-anterior (PA) 20	Submento-vertex (SMV)
	Lateral	Tangential
	Townes (1/2 axial view)	
Facial bones	Occipito-mental (OM)	Zygoma
	OM 30 Lateral	Reduced exposure SMV
Paranasal sinuses	OM for maxillary antra	Upper occlusal or lateral SMV
		Dental panoramic tomography (DPT), tomography
Orthodontics	DPT	
	Cephalometric lateral skull	
Pre- and post-osteotomy	DPT	
	Cephalometric lateral skull	
	Cephalometric PA skull	
Nasal bones	OM 30	
	Lateral	
	Soft tissue lateral	
Mandible	DPT	Lateral obliques
		PA mandible
		Mandibular occlusal
Temporomandibular joints	Transcranial lateral obliques or DPT (mouth open and closed)	Transpharyngeal Arthrography Reverse Townes Reverse DPT Consider CT scan/ MRI

[a] CT scanning is valuable in craniofacial injuries.

Radiography requests are essential to enable the radiographic staff to provide the best or most appropriate radiographs for the region under investigation:

1. Fill in the request form as fully as possible with full, relevant, clinical findings.
2. Request the region required rather than specific views, except for dental panoramic tomography, when the term 'DPT' will suffice.

COMPUTED (AXIAL) TOMOGRAPHY

A computed tomography (CT) or computed axial tomography (CAT) scan is a type of repeated special radiograph taken across 'slices' of the body to build up a complex image, using several beams simultaneously from a number of different angles (Fig. 2.30). Cone beam CT (CBCT) is a variant, increasingly used in dentistry for implant work especially (see below).

Advantages

- CT provides good anatomical representation of hard tissues (bone and cartilage).
- It is generally better than magnetic resonance imaging (MRI) for examining lymph nodes.
- It provides good cross-sectional representation.

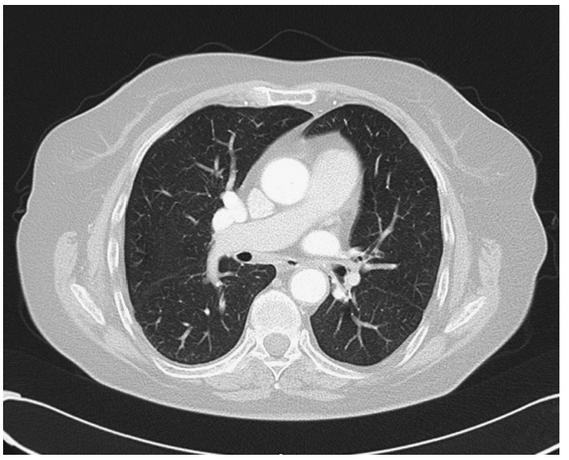

Fig. 2.30 Computed tomography scan of chest.

- Multiplanar reconstruction is possible from the raw data of the initial examination.
- Three-dimensional reconstruction is possible.
- It provides guidance for biopsies.
- Compared with MRI:
  imaging is more rapid (in seconds – compared with MRI, which takes minutes)
  it is less affected by motion artefact, since it is quicker
  it can be used on patients for whom MRI is inappropriate (e.g. claustrophobics, or people with pacemakers or ferrous or paramagnetic aneurysm clips).

Disadvantages

- CT gives a significant radiation dose.
- It provides phasic imaging of vascular structures and tumours.
- It is an expensive procedure.
- The whole CT procedure may take up to 1 hour, but often takes less than 30 minutes.
- Some patients experience claustrophobia in the CT scanner.

Indications

CT allows visualization of 3–10-mm sections of the body in two dimensions with enough clear distinction between black, grey and white areas of the image to allow pathological diagnosis in many cases.

It is particularly useful in examining the chest or abdomen. CT using contrast media makes it possible to visualize abnormalities more clearly.

Contraindications

Contraindications include pregnancy and history of severe allergies; this may preclude the use of a contrast agent.

Procedure

1. Patients may be asked not to eat beforehand.
2. Patients may have to swallow or be injected intravenously with contrast material that will show up against the tissue on the final pictures.

3. Patients must lie on a couch, which will move through the scanner.
4. The radiographer can see, hear and communicate with the patient (by means of a two-way microphone and speaker system) at all times.
5. The scanner will take a series of pictures.
6. Patients must lie still while images are being taken in order to ensure that they are in focus, and may be asked to hold their breath so the scan is not blurred.

CONE BEAM CT (CBCT)

This is CT in which the X-rays are divergent, forming a cone. CBCT is useful in implantology, endodontics and orthodontics, for accurate visualization of the jaws, teeth and roots (erupted and non-erupted) and of anomalous structures that conventional 2D radiography cannot capture.

SCINTIGRAPHY/NUCLEAR MEDICINE

Radionuclide (radioisotope) scans can be particularly useful for detecting abnormalities in bone, salivary glands, thyroid gland and lymph nodes. The common radionuclide agents used include technetium-99^{m} (Tc-99m) – labelled diphosphonates for bone scans, and gallium for imaging lymph nodes.

Radionuclide scanning involves administration of a radionuclide with an affinity for the organ or tissue of interest, and recording of the distribution of radioactivity. A very small amount of a mildly radioactive liquid is injected into a vein, usually in the arm; after the injection, the patient will have to wait up to 3 hours before the scan can be taken. The distribution of the radionuclide is detected in the tissue/organ under examination where the isotope is concentrated, by a gamma camera, which produces the images or scans after processing by a computer. Detectors record activity in retaining organs at the time of acquisition. Time/activity curves can be plotted to provide functional analysis. The images can then be produced on film or coloured paper, or as graphs or numerical data. The amount of radioactivity given to a patient is small, not dangerous either to the patient or to anyone nearby, and usually clears from the body within 24 hours.

POSITRON EMISSION TOMOGRAPHY

Radioactive molecules made from radionuclides (radioactive isotopes) with short half-lives, such as ^{11}C, ^{15}O or ^{13}N, are injected intravenously. Depending on the type of molecule injected, positron emission tomography (PET) can provide information on different biochemical functions. For example, if glucose is used, the PET scan will show an image of glucose metabolism, or how much energy the body is using in a specific area (such as the brain or a tumour).

MAGNETIC RESONANCE IMAGING (NUCLEAR MAGNETIC RESONANCE)

Magnetic resonance imaging (MRI) is a safe, non-invasive procedure that allows three-dimensional images of internal organs to be created with radio waves and large powerful electromagnets to align hydrogen atoms (protons) within the body (Fig. 2.31).

Advantages

- There is no ionizing radiation.
- MRI provides new, rapidly developing, good multiplanar imaging.

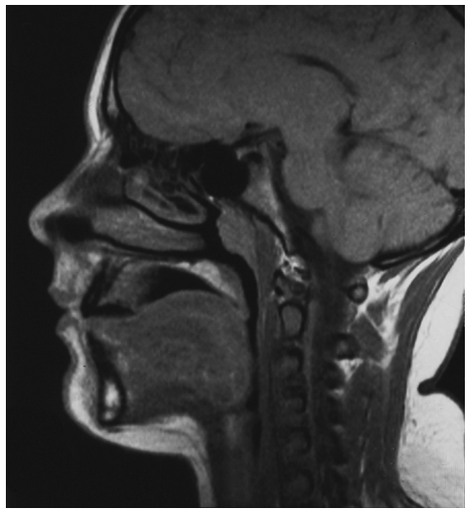

Fig. 2.31 Magnetic resonance image of head and neck.

- It provides good soft-tissue differentiation, which is better than that with CT.
- It provides good imaging of bone marrow.
- It provides good imaging of perineural infiltration.
- Pictures can be taken from multiple angles.
- It can be performed through clothing and through dense tissue such as bone.
- There is less distortion from dental restorations than with CT.

Disadvantages

MRI is dangerous for people with pacemakers or defibrillators and inappropriate for those with ferrous or paramagnetic aneurysm clips (Ch. 5). Currently, MRI is relatively expensive and time-consuming (it can take anything from 30 minutes to 1 hour and 30 minutes, or even 2 hours), and is rather noisy; some ———patients experience claustrophobia. It can also be affected by motion artefact, since it is slow. Gadolinium contrast medium is injected intravenously in up to 30% of MRI scans to improve the clarity.

Indications

MRI, like CT, can be used to produce cross-sectional views of the body or a body part, but can also obtain other views such as sagittal. It allows a clear distinction between black, grey and white areas of the image to aid pathological diagnosis in many cases.

Again like CT, MRI can be used on any part of the body but is frequently employed to examine the head and brain, since it is in this region that it produces clearer results than CT. MRI is also useful for detecting abnormalities in soft tissues and in chest or abdominal examination.

Contraindications

These include:

- presence of a cardiac pacemaker, defibrillator or monitor
- presence of vascular or surgical clips
- presence of any type of orthopaedic prosthesis, rods or pins
- presence of dentures or appliances of any type in the mouth, which must be removed before the scan (implants, fixed crowns or restorations are not contraindications; see below)

- presence of an intrauterine contraceptive device (IUD)
- pregnancy – any effects of MRI on pregnancy are unclear
- history of allergies – may preclude the use of contrast agent.

Procedure

1. Patients may be asked not to eat for 1 hour before the scan; not to smoke for 2 hours before; and not to drink tea, coffee, alcohol or soft drinks containing caffeine (cola, etc.) for 2 hours before. These can influence blood flow and so affect the scan. Iron interferes with MRI and thus iron-containing medications should not be taken.
2. As the MRI scan uses magnetism, metals may affect it. Persons with certain types of metal surgical clips, metal pins or plates, cardiac monitors, defibrillators or pacemakers cannot, therefore, have an MRI scan. The patient must remove everything metal, including watches, any jewellery including piercings, metal clothes closures, belts, metal-containing prostheses, hair clips, shoes, mobile phones, personal organizers, keys, purses and wallets containing magnetic strip credit cards. These must all be left outside the room.
3. MRI scans are noisy, so the patient wears ear plugs.
4. The patient must lie on a couch that can move backwards and forwards through the cylinder.
5. Patients must lie still while images are being taken in order to ensure that they are in focus, and may be asked to hold their breath so the scan is not blurred.
6. The radiographer can see, hear and communicate with the patient (by means of a two-way microphone and speaker system) at all times.
7. The MRI is in a special room that excludes radio waves, as these interfere with the scan.

ULTRASOUND (ULTRASONOGRAPHY)

Ultrasound is the use of high-frequency sound waves (at a frequency of over 20 000 Hz [20 kHz]), which are reflected at interfaces between tissues. An ultrasound scan uses very high-frequency sound waves not audible to the human ear, which are passed through the body using a transmitter or scanner that is normally placed on the skin surface. The pattern of the reflected sound waves or 'echoes' is used to create an outline of the organ in question, so ultrasonography is used for soft tissues rather than bony structures. It can measure size, detect structural abnormalities, determine whether a lump is solid or fluid-filled, and monitor growth of the fetus during pregnancy.

Advantages

- Ultrasound examination is completely painless and safe.
- It produces no ionizing radiation.
- It is inexpensive and provides a good screening test.
- The equipment is mobile.
- It provides good differentiation between cystic and solid soft-tissue masses.
- Advanced technique (Doppler) assesses flow characteristics in vessels.

Indications

- To diagnose disease in liver, gallbladder, pancreas, urinary bladder, prostate, kidney, thyroid gland, lymph nodes, salivary glands, ovaries or testicles, and breast
- In obstetrics, to check that there are no fetal abnormalities, and to monitor fetal growth
- For ophthalmic imaging
- To examine blood flow
- To diagnose aneurysms
- For echocardiography.

Contraindications

None known.

Procedure

1. Ultrasound examination takes between 15 minutes and 1 hour.
2. Usually, a lubricating silicone gel applied to the skin is used to help conduct the sound waves into the body.
3. Patients must lie still during the examination.
4. For some more specialized kinds of ultrasound examination, the probe is inserted into the body.
5. In abdominal ultrasound scanning, large amounts of gas in the intestine can interfere with the images. Therefore, in these instances, low-fibre foods should be taken for 24–36 hours before the examination. Some examinations of the intestines, for example, require a preparatory enema and fasting for several hours before the appointment. Others, as used in obstetrics, may require a full bladder.

LABORATORY INVESTIGATIONS

HISTOPATHOLOGY

A biopsy that is of adequate size and representative of the lesion should be taken, placed in a fixative and sent to the pathology laboratory carefully labelled and with the appropriate form of request for histopathological examination.

- Specimens for *routine histological examination* should be fixed in 10% formol saline; at least ten times the volume of the specimen is needed for adequate fixation.
- Specimens for *immunofluorescent investigations* are not usually carried out on formol saline-fixed tissue, but should be sent in a suitable transport medium for immediate freezing at −70°C and direct immunofluorescence. Serum should also be sent for indirect immunofluorescence.

If tuberculosis or a systemic mycosis is suspected, a fresh tissue specimen should be sent for culture.

MICROBIOLOGY

Specimens should be collected before antimicrobials are started. If pus is present, a sample should be sent in a sterile container, in preference to a swab. Requests for culture and antibiotic sensitivity should indicate possible aetiology, present antimicrobial therapy and any drug allergies. If tuberculosis is suspected, this must be clearly indicated on the request form.

If the microbiological specimen cannot be dealt with within 2 hours, the swab should be placed in transport medium and kept in the refrigerator at 4°C (not a freezer) until dealt with by the microbiology department.

Actinomycosis

It is preferable to send pus for culture but, in the absence of adequate pus, send a dressing that has been in contact with the wound for several hours.

Candidosis

Swabs from the lesions and from the fitting surface of the denture may be sent for Gram stain or culture.

Viral hepatitis or HIV infection

Many centres have defined protocols for the collection of specimens from patients with suspected hepatitis or HIV infection. Particular care must be taken to avoid needlestick injuries and contamination of the outside of the containers, and to indicate that hazard may be posed by the infection. Special coloured plastic bags (usually red) to indicate this hazard can be used for transporting the specimen. Consent is required when testing.

Other viral infections

Swabs must be sent in viral transport medium; dry swabs are no use. Nucleic acid testing is increasingly common. Acute and convalescent serum samples (10 mL blood in a plain container) may be taken; convalescent serum is collected 2–3 weeks after the acute illness.

Syphilis

Oral lesions should be cleaned with saline to remove oral treponemes before a smear is made for dark-ground examination; 10 mL of serum should be sent for Venereal Disease Research Laboratory (VDRL) testing (Ch. 21).

HAEMATOLOGY

Blood for film and red cell indices must be collected in a tube containing potassium ethylenediamine tetra-acetic acid (EDTA; 4 mL into an EDTA tube). EDTA inhibits clotting through its action on cation-dependent proteolytic enzymes critical to the clotting cascade. The blood must be gently mixed to ensure that the anticoagulant is well distributed; clotted samples are useless. Blood for assay of corrected whole blood folate levels is also collected in an EDTA tube. Most other necessary investigations are performed on serum (Appendix 2.3). Any venepuncture episode requires consent, both for the insertion of the needle and for the investigations being carried out on the blood sample. See Table 2.14 for potential complications.

BIOCHEMISTRY

There is currently some variation as to whether serum or plasma is needed for certain biochemical tests, depending on the laboratory involved. Special containers may be required for automated multichannel analysers, which give a full biochemical profile on a single blood specimen. However, most biochemical estimations can be carried out on serum (collect blood in a plain container), although plasma (collect in a lithium heparin tube) may be needed for estimation of electrolytes, cortisol and proteins. Blood glucose assays are carried out on a sample in a fluoride bottle. Urinalysis is also available (Appendices 2.4 and 2.5).

IMMUNOLOGY

Most tests of humoral immunity and complement components are carried out on serum (plain tube). Autoantibodies are detected in serum. In order to prevent the rapid decay of complement components, the serum should be separated as soon as possible and frozen at −20°C at least and preferably at −70°C. Serum for immune complexes and cryoglobulins may need special handling, details of which can be obtained from the relevant laboratory.

Tests of cell-mediated immunity are expensive and often can be carried out only once special preparations have been made (consult the laboratory; Appendix 2.6).

See above for direct immunofluorescence specimens.

The presence of autoantibodies does not always indicate disease and absence does not necessarily exclude it. The type of autoimmune disorder or disease that occurs and the amount of destruction depend on which systems or organs are targeted by the autoantibodies, and how strongly. Disorders caused by organ-specific autoantibodies, those that primarily target a single organ, such as the thyroid in Graves disease and Hashimoto thyroiditis, are often the easiest to diagnose as they frequently present with organ-related disease.

Once a diagnosis has been made and a treatment plan has been decided on, it must be explained to the patient and informed consent must be obtained.

Table 2.14 *Complications of venepuncture*

Complication	Remarks
Failure in a young normal adult	Relax. Correct application of tourniquet. Warm arm/hand. Check syringe and needle will aspirate
	Try other arm; use sphygmomanometer cuff at just below diastolic pressure; make sure you can palpate vein before trying again
Difficult patients	
Fat arm: veins difficult to locate	Remember that veins are there. Palpate antecubital fossa over usual vein site (see text)
	If unsuccessful, try veins on radial side of wrist or on back of hand (painful)
Thin arm: veins move away from the needle	Most annoying! Insert needle deliberately alongside vein, preferably at a Y-junction, and immobilize vein with your other hand before penetrating vein from side
Haematoma formation	Most annoying to patient! Caused by poor technique, inadequate pressure to puncture site or removal of needle before removal of tourniquet. May cause venous thrombosis. Try not to penetrate through other side of vein. Keep firm pressure with swab on vein after venepuncture until haemostasis secured. In the elderly, maintain this pressure for several minutes

KEY WEBSITES

(Accessed 8 July 2013)

Dental Protection. Exercise in risk management: the medical history. <http://www.dentalprotection.org/uk/risk_management/>.

General Dental Council. Maintaining standards: guidance to dentists on professional and personal conduct. <http://www.gdc-uk.org/Newsandpublications/Publications/Publications/MaintainingStandards[1].pdf>.

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APPENDIX 2.1 SUGGESTED MEDICAL QUESTIONNAIRE FOR PATIENTS TO COMPLETE[a]

	Question	Yes	No	Details
1	Have you had an operation or general anaesthetic before?			
2	Have you had any problems with anaesthetics?			
3	Have any of your relatives had any problems with anaesthetics?			
4	Are you taking any drugs or other medications (inhalers, Pill)?			
5	If female, are you or could you be pregnant?			
6	Have you had any corticosteroid drugs in the past? If yes, when?			
7	Do you have any allergies (drugs, plasters, latex, antiseptics, foodstuffs)?			
8	Do you have heart disease or have you had a heart attack?			
9	Do you ever have to take antibiotics routinely prior to dental surgery?			
10	Do you get chest pains, indigestion or tummy acid in the throat?			
11	Do you have a hiatus hernia?			
12	Do you have high blood pressure?			
13	Do you get breathless walking, climbing stairs or lying flat?			
14	Do you have asthma, bronchitis or chest disease?			
15	Have you ever had a convulsion or fit?			
16	Do you have arthritis or muscle disease?			
17	Do you have anaemia or any other blood disorder?			
18	Do you know your sickle status (if relevant)?			
19	Have you ever had liver disease or been jaundiced?			
20	Have you ever had kidney disease?			
21	Do you have diabetes (sugar in your urine)?			
22	Do you smoke? If yes, how many cigarettes a day (also last 6 months)?			
23	Do you take recreational drugs or drink alcohol? If yes, how many units per week?			
24	Do you have any crowns, loose teeth or artificial teeth? Indicate:			
25	Do you wear contact lenses?			
26	Is there anything else you think the surgeon or anaesthetist should know?			

[a]Other useful formats are available, such as that referenced in the Resuscitation Council UK document 2006 on *Medical emergencies for dental practitioners.*

APPENDIX 2.2 COMPLEX MEDICAL HISTORY AS PROVIDED BY A DENTAL PATIENT

Medical Information Sheet

Name: **Blood Group:** A + **Situation:** Lives alone

Address:	
Phone:	
Only in real emergency:	**1st contact:** **2nd contact:** **3rd contact:**
Allergies:	To medication – Trimethoprim, preservatives and lanolin in eye ointments/drops. Airborne – Pollens, moulds. Photosensitivity reactions (Polymorphic light eruption). Oral allergy syndrome, sticky dressings, dogs, cats
Vaccinations:	Tetanus 1994, BCG 1986, Hep B booster 1997, Polio booster 1999, Hep A booster 2001, H1N1 swine flu vaccinations 2009, annual influenza vaccination, pneumococcal vaccine Nov 2010
Conditions:	**Current: Systemic autoimmune disease (atypical primary Sjögren syndrome) with associated complications:** Ophthalmological (Keratoconjunctivitis sicca (KCS)), CNS (Autoimmune myelitis: inflammatory non-compressive cervical cord myelopathy/Sjögren myelopathy), Renal (Chronic kidney disease (CKD) Stage 3 (lowest eGFR 49)), Urological (Interstitial cystitis (IC)/Painful bladder syndrome), Dermatological (Intermittent 'sterile neutrophilic folliculitis' rash poss associated with autoimmune disease, generalized mucosal and skin dryness), generalized (Periodic lymphadenopathy/'flu-like symptoms, severe fatigue), Gynaecological (vestibulodynia). **Other conditions:** Pineal region brain tumour (histological type not known), GI: Severe idiopathic slow-transit constipation, Psychiatric: Major depressive disorder, severe generalized anxiety, Urological: Urethral stenosis, Dermatological: Polymorphic light eruption, seborrhoeic dermatitis, intermittent acne, intermittent mild eczema, Gynaecological: Bartholin cyst (recurrence). **Resolved:** Healed pyoderma gangrenosum (PG) R. leg, costochondritis, **Recently:** Unexplained severely painful, possibly reactive, condition of tongue (instrinsic and ulcerative, desquamating) for 2 weeks between multiple infections requiring 3 antibiotics (URTIs and acute labyrinthitis and streptococcal tonsillitis). **Ongoing investigation/monitoring:** Brain tumour, myelitis, renal function.
Prescribed Drugs:	**Long-term: For autoimmune disease:** Salagen (oral pilocarpine) 5 mg every 3 h (max 6 daily) **(always kept with me for quick self-administration as wears off fast),** Plaquenil (hydroxychloroquine) 200 mg every other morning with food, Viscotears preservative-free single-dose vials of carbomer 974P artificial tears at least 4 times a day, more freq as needed, diazepam (and for neuro motor symptoms) 5 mg p.r.n. **For depression:** Seroquel (quetiapine) 100 mg night, Stilnoct (zolpidem) 10 mg night, trazadone 150 mg night. **For seborrhoeic dermatitis:** ketoconazole shampoo daily, aqueous cream, E45 bath oil, Lotriderm p.r.n. **For neutrophilic rash:** Dermovate p.r.n. **For IC and myelopathic paraesthesia:** imipramine 25 mg night. **For chronic idiopathic constipation:** Resolor 2 mg daily, docusate sodium 3 times a day. **For acne when returns:** Tetralysal 300 (lymecycline) 1–2 tabs. **Periodically: For pain:** Arcoxia sparingly (as contraindicated with CKD), co-codamol. **For vestibulodynia:** 5% lidocaine ointment p.r.n, **Discontinued: For KCS:** Restasis (ciclosporin 0.05% emulsion single-unit eye drops) every 12 h (on named-patient basis) for appx 4 y, Circadin (melatonin) 1 tab nocte. **For depression:** lithium, Cipralex. **Steroids previously received: For myelitis:** 3 pulsed steroid IV infusions in Feb '06 (1000 mg methylprednisolone each time), **For PG:** oral EC prednisolone (3 mths in '06), **For Sjögren lymphadenopathy/'flu-like syndrome:** IM DepoMedrone steroid injection 120 mg Nov '09, **For neutrophilic rash and lymphadenopathy:** oral EC prednisolone (4 days 30 mg Aug '10, 8 days 15 mg and 6 days 20 mg Sep '10), **For neutrophilic rash:** IM DepoMedrone steroid injection 120 mg Sep '10. **For costochondritis:** local cortisone injection into chest Sep '10. (**General note about prescribing** – consider potential of medications to exacerbate symptoms of Sjögren syndrome – e.g. caution with anticholinergics, etc.).
In case of General Anaesthetic:	***To avoid exacerbation of Sjögren syndrome symptoms: AVOID prolonged NPO, allow clear liquids till 2 h prior, omit drying agents, add humidifier to rebreathing system, lubricate ETTs/LMAs well, place w caution, use humidified O_2, lubricate eyes with preservative-free carbomer artificial tears, i.e. Viscotears, maintain warmth***

General Practitioner:	
Consultants: Neurologist:	Current:
Neurosurgeon:	
Ophthalmologist:	
Rheumatologist:	
Nephrologist:	
Urologist:	
Dermatologist:	
Gastroenterologist:	
Medical Insurance UK:	BUPA 'Heartbeat' Number
Travel Insurance:	'Flysure':

If in contact with BUPA or Flysure: please do not disclose confidential medical history, only current reason for assistance!)

Fig. 2.32 eGFR = estimated glomerular filtration rate; URTI = upper respiratory tract infection.

APPENDIX 2.3 INTERPRETATION OF HAEMATOLOGICAL RESULTS

Blood	Normal range[a]	Level ↑	Level ↓
Haemoglobin (Hb)	Male 13.0–18.0 g/dL Female 11.5–16.5 g/dL	Polycythaemia (rubra vera or physiological); myeloproliferative disease; dehydration	Anaemia
Haematocrit (packed cell volume [PCV])	Male 40–54% Female 37–47%	Polycythaemia; dehydration	Anaemia
Mean cell volume (MCV) MCV = PCV/RBC	78–99 fl	Macrocytosis in vitamin B_{12} or folate deficiency; liver disease; alcoholism; hypothyroidism; myelodysplasia; myeloproliferative disorders; aplastic anaemia; cytotoxic agent	Microcytosis in iron deficiency, thalassaemia, chronic disease
Mean cell haemoglobin (MCH) MCH = Hb/RBC	27–31 pg/cell	Pernicious anaemia	Iron deficiency; thalassaemia; sideroblastic anaemia
Mean cell haemoglobin concentration (MCHC) MCHC = Hb/PCV	32–36 g/dL		Iron deficiency; thalassaemia; sideroblastic anaemia; anaemia in chronic disease
Red cell count (RBC)	Male 4.2–6.1 $\times 10^{12}$/L Female 4.2–5.4 $\times 10^{12}$/L	Polycythaemia	Anaemia; fluid overload
White cell count (WCC; total)	4–10 $\times 10^{9}$/L	Infection; inflammation; leukaemia; intense exercise; trauma; stress; pregnancy	Early leukaemia; some infections; bone marrow disease; drugs, including corticosteroids and chemotherapy; idiopathic
Neutrophils	Average 3.3 $\times 10^{9}$/L	Pregnancy; exercise; infection; bleeding; trauma; malignancy; leukaemia; corticosteroids	Some infections; drugs; endocrinopathies; bone marrow disease; idiopathic
Lymphocytes	Average 2.5 $\times 10^{9}$/L	Physiological; some infections; leukaemia; lymphoma	Some infections; some immune defects (e.g. HIV, AIDS); lymphoma; corticosteroids; systemic lupus erythematosus (SLE)
Eosinophils	Average 0.15 $\times 10^{9}$/L	Allergic disease; parasitic infestations; skin disease; malignancy, including lymphoma	Some immune defects
Platelets	150–400 $\times 10^{9}$/L	Thrombocytosis in bleeding; myeloproliferative disease; chronic inflammatory states	Thrombocytopenia related to leukaemia; drugs; HIV; other infections; idiopathic; autoimmune; disseminated intravascular coagulopathy (DIC)
Reticulocytes	0.5–1.5% of RBC	Haemolytic states; during treatment of anaemia	Chemotherapy; bone marrow disease
Erythrocyte sedimentation rate (ESR)	0–15 mm/h	Pregnancy; infections; anaemia; inflammation; connective tissue disease; temporal arteritis; trauma; infarction; tumours	–
Plasma viscosity	1.4–1.8 cp	As ESR	

[a]Adults unless otherwise stated. Check values with your laboratory.

APPENDIX 2.4 INTERPRETATION OF BIOCHEMICAL RESULTS[a]

Biochemistry[b]	Level[c] ↑	Level[c] ↓
Acid phosphatase	Prostatic malignancy; renal disease; acute myeloid leukaemia	–
Alanine transaminase (ALT)[d]	Liver disease; infectious mononucleosis	Hypothyroidism; hypophosphatasia; malnutrition
Alkaline phosphatase	Puberty; pregnancy; Paget disease; osteomalacia; fibrous dysplasia; malignancy in bone; liver disease; hyperparathyroidism (some); hyperphosphatasia	–
$Alpha_1$-antitrypsin	Liver cirrhosis	Congenital emphysema
Alpha-fetoprotein (AFP)	Pregnancy; gonadal tumour; liver disease	Fall in level in pregnancy indicates fetal distress
Amylase	Pancreatic disease; mumps; some other salivary diseases	–
Angiotensin-converting enzyme (ACE)	Sarcoidosis	–
Antistreptolysin O titre (ASOT)	Streptococcal infections; rheumatic fever; drugs[f]	–
Aspartate transaminase (AST)[e]	Liver disease; biliary disease; myocardial infarct; trauma; drugs[f]	–
Bilirubin (total)	Liver or biliary disease; haemolysis	–
Brain natriuretic peptide (BNP)	Cardiac failure	–
Caeruloplasmin	Pregnancy; cirrhosis; hyperthyroidism; leukaemia	Wilson disease
Calcium	Primary hyperparathyroidism; malignancy in bone; renal tubular acidosis; sarcoidosis; thiazides; calcium supplements; excess vitamin D	Hypoparathyroidism; renal failure; rickets; nephrotic syndrome; chronic renal failure; lack of vitamin D; low magnesium levels; acute pancreatitis
Cholesterol	Hypercholesterolaemia; pregnancy; hypothyroidism; diabetes; nephrotic syndrome; liver or biliary disease	Malnutrition; hyperthyroidism
Complement (C3)	Trauma; surgery; infection	Liver disease; immune complex diseases (e.g. systemic lupus erythematosus [SLE])
Complement (C4)	–	Liver disease; immune complex diseases; hereditary angioneurotic oedema (HANE)
Cortisol (see Steroids)	–	–
Creatine kinase (CK)	Myocardial infarct; trauma; muscle disease; rhabdomyolysis; statins	–
Creatinine	Renal failure; urinary obstruction	Pregnancy
C-reactive protein (CRP)	Inflammation; trauma; myocardial infarct; malignant disease	–
C1 esterase inhibitor	–	Hereditary angiodema
Cyclic citrullinated peptide (CCP)	Rheumatoid arthritis	–
Erythrocyte sedimentation rate (ESR)	Inflammation; trauma; myocardial infarct; malignant disease	–
Ferritin	Liver disease; haemochromatosis; leukaemia; lymphoma; other malignancies; thalassaemia	Iron deficiency
Fibrinogen	Pregnancy; pulmonary embolism; nephritic syndrome; lymphoma	Disseminated intravascular coagulopathy (DIC)
Folic acid	Folic acid therapy	Alcoholism; dietary deficiency; haemolytic anaemias; malabsorption; myelodysplasia; phenytoin; methotrexate; trimethoprim; pyrimethamine; sulfasalazine; cycloserine; oral contraceptives; pregnancy
Free thyroxine index (FTI; serum T4 and T3 uptake)	Hyperthyroidism	Hypothyroidism
Gamma-glutamyl transpeptidase (GGT)	Alcoholism; obesity; liver disease; myocardial infarct; pancreatitis; diabetes; renal diseases; tricyclics	–
Globulins (total; see also Protein)	Liver disease; multiple myeloma; autoimmune disease; chronic infections	Chronic lymphatic leukaemia; malnutrition; protein-losing states
Glucose	Diabetes mellitus; pancreatitis; hyperthyroidism; hyperpituitarism; Cushing disease; liver disease; post head injury	Hypoglycaemic drugs; Addison disease; hypopituitarism; hyperinsulinism; severe liver disease
Hydroxybutyrate dehydrogenase (HBD) immunoglobulins	Myocardial infarct	–
Total immunoglobulins	Liver disease; infection; sarcoidosis; connective tissue disease	Immunodeficiency; nephrotic syndrome; enteropathy
IgG	Myelomatosis; connective tissue disorders	Immunodeficiency; nephrotic syndrome
IgA	Alcoholic cirrhosis; Berger disease	Immunodeficiency

(*Continued*)

Biochemistry[b]	Level[c] ↑	Level[c] ↓
IgM	Primary biliary cirrhosis; nephrotic syndrome; parasites; infections	Immunodeficiency
IgE	Allergies; parasites	–
Lactate dehydrogenase (LDH)	Myocardial infarct; trauma; liver disease; haemolytic anaemias; lymphoproliferative diseases	Radiotherapy
Lipase	Pancreatic disease	–
Lipids (triglycerides)	Hyperlipidaemia; diabetes mellitus; hypothyroidism; hyper-vitaminosis D	–
Magnesium	Renal failure	Cirrhosis; malabsorption; diuretics; Conn syndrome; renal tubular defects
Nucleotidase	Liver disease	–
Percent carbohydrate-deficient transferrin	Alcoholism	–
Phosphate	Renal failure; bone disease; hypoparathyroidism; hyper-vitaminosis D	Hyperparathyroidism; rickets; malabsorption syndrome; insulin
Potassium	Renal failure; Addison disease; ACE inhibitors; potassium supplements	Vomiting; diabetes; Conn syndrome; diuretics; Cushing disease; malabsorption; corticosteroids; salbutamol
Protein (total)	Liver disease; multiple myeloma; sarcoid; connective tissue diseases	Pregnancy; nephrotic syndrome; malnutrition; enteropathy; renal failure; lymphomas
Albumin	Dehydration	Liver disease; malnutrition; malabsorption; nephrotic syndrome; multiple myeloma; connective tissue disorders
$Alpha_1$-globulin	Oestrogens	Nephrotic syndrome
$Alpha_2$-globulin	Infections; trauma	Nephrotic syndrome
Beta-globulin	Hypercholesterolaemia; liver disease; pregnancy	Chronic disease
Gamma-globulin	(see Immunoglobulins)	Nephrotic syndrome; immunodeficiency
Serum GGT (SGGT; see GGT)	–	–
Serum glutamic oxaloacetic transaminase (SGOT; see AST)	–	–
Serum glutamic pyruvic transaminase (SGPT; see ALT)	–	–
Sodium	Dehydration; Cushing disease	Cardiac failure; renal failure; syndrome of inappropriate antidiuretic hormone (SIADH); Addison disease; diuretics
Steroids (corticosteroids)	Cushing disease; some tumours	Addison disease; hypopituitarism
Thyroxine (T4)	Hyperthyroidism; pregnancy; oral contraceptive	Hypothyroidism; nephrotic syndrome; phenytoin
Troponin	Myocardial infarct	–
Urea	Renal failure; dehydration; gastrointestinal bleed	Liver disease; nephrotic syndrome; pregnancy; malnutrition
Uric acid	Gout; leukaemia; renal failure; multiple myeloma	Liver disease; probenecid; allopurinol; salicylates; other drugs
Vitamin B_{12}	Liver disease; leukaemia; polycythaemia rubra vera	Pernicious anaemia; gastrectomy; Crohn disease; ileal resection; veganism; metformin

[a]Absolute value ranges may differ from laboratory to laboratory. There are also many more causes of abnormal results than are outlined here. SI values: 10^{-1}, deci (d); 10^{-2}, centi (c); 10^{-3}, milli (m); 10^{-6}, micro (μ); 10^{-9}, nano (n); 10^{-12}, pico (p); 10^{15}, femto (f).
[b]Serum or plasma.
[c]Adult levels; always consult your own laboratory.
[d]ALT = SGPT (serum glutamate–pyruvate transaminase).
[e]AST = SGOT (serum glutamate–oxaloacetic transaminase).
[f]Ampicillin, cefalotin, cloxacillin, erythromycin, indometacin, methotrexate, opioids.

APPENDIX 2.5 URINALYSIS: INTERPRETATION OF RESULTS[a]

Colour	Protein	Glucose[b]	Ketones	Bilirubin[c]	Urobilinogen[c]	Blood[d]
Comment						
–	Tetrabromphenol blue dye binds to some proteins in urine – mainly albumin. Not all proteins are detected and the sensitivity is not high	–	–	–	–	Tests for intact red cells and free haemoglobin (Hb)
Health						
Yellow	Usually no protein, but a trace can be normal in young people	Usually no glucose, but a trace can be normal in 'renal glycosuria' and pregnancy	Usually no ketones but ketonuria may occur in vomiting, fasting or starvation	Usually no bilirubin	Usually present in normal healthy patients, particularly in concentrated urine	Usually no blood
False positives						
Red: beet	Alkaline urine. Container contaminated with disinfectant (e.g. chlorhexidine). Blood or pus in urine. Polyvinyl pyrrolidone infusions	Cefamandole. Container contaminated with hypochlorite	Patients on L-dopa or any phthalein compound	Chlorpromazine and other phenothiazines	Infected urine. Patients taking ascorbic acid, sulphonamides or paraminosalicylate	Menstruation. Container contaminated with some detergents
Disease						
Brown: homogentisic acid, bilirubin, urobilin, porphyrins	Renal diseases. Also cardiac failure, diabetes, endocarditis, myeloma, amyloid, some drugs, some chemicals	Diabetes mellitus. Also in pancreatitis, hyperthyroidism, Fanconi syndrome, sometimes after a head injury, other endocrinopathies	Diabetes mellitus. Also in febrile or traumatized or starved patients on low-carbohydrate diets	Only where conjugated bilirubin is increased – hepatocellular and obstructive liver disease	Haemolytic or hepatic, hepatocellular or obstructive disease. Prolonged antibiotic therapy	Genitourinary diseases. Also in bleeding tendency, haemolysis, rhabdomyolysis, some infections where bacteria contain hydroperoxidase, some drugs, endocarditis
Red: Hb Milky: chyluria						

[a]Using test strips (e.g. Ames reagent strips, BM-Test-5L, Diastix or Diabur strips). Normal or non-fresh urine may be alkaline; normal urine may be acid. Nitrites and leukocyte esterase positivity suggests a urinary tract infection.
[b]Dopa, ascorbate or salicylates may give false negatives.
[c]May be false negative if urine not fresh.
[d]Ascorbic acid may give false negative.

APPENDIX 2.6 SOME IMPORTANT AUTOANTIBODIES[a]

Autoantibodies	Main associations
Anti-actin	Autoimmune hepatitis, coeliac disease
Anti-epithelial	
Anti-basement membrane zone	Pemphigoid
Intercellular cement (desmoglein)	Pemphigus
Anti-ganglioside antibodies	
Anti-GD3	Guillain–Barré syndrome
Anti-GM1	Travellers' diarrhoea
Anti-GQ1b	Miller–Fisher syndrome (see Guillain–Barré syndrome)
Anti-gastric parietal cell	Pernicious anaemia
Anti-glomerular basement membrane (anti-GBM) antibody	Goodpasture syndrome
Anti-Hu	Neuroblastoma
Anti-intrinsic factor	Pernicious anaemia
Anti-islet cell	Diabetes type 1
Anti-Jo 1 (GAD65)	Polymyositis, dermatomyositis
Anti-liver/kidney microsomal 1 (anti-LKM 1 antibodies)	Chronic hepatitis C
Anti-Ku	Polymyositis/scleroderma (PM/Scl) overlap syndrome
Anti-mitochondrial	Primary biliary cirrhosis
Anti-neutrophil cytoplasmic (ANCA)	
pANCA (perinuclear; anti-myeloperoxidase)	Ulcerative colitis, polyarteritis nodosa
cANCA (cytoplasmic proteinase 3; anti-PR3)	Wegener granulomatosis
Antinuclear (ANA) anti-extractable nuclear antigen (anti-ENA)	
Anti-p62	Primary biliary cirrhosis
Anti-sp100	Primary biliary cirrhosis
Anti-glycoprotein210	Primary biliary cirrhosis
Anti-double-stranded (ds) DNA	Antibody with the highest specificity for systemic lupus erythematosus (SLE) and found in most patients
Anti-Ro (Robair)	Sjögren syndrome
Anti-La (Lattimer)	Sjögren syndrome
Anti-RNP	Mixed connective tissue disease (MCTD)
Anti-Sm	SLE
Anti-PM/Scl (anti-exosome)	PM/Scl overlap syndrome
Anti-Scl 70	
Anti-topoisomerase	Scleroderma
Anti-centromere	CREST (calcinosis, Raynaud, oesophageal dysfunction, scleroderma, telangiectasia) syndrome
Anti-smooth muscle	Autoimmune hepatitis
Anti-steroid 21-hydroxylase (21-OH)	Addison disease
Anti-thyroid	
Thyroid peroxidase (TPOAb)	Hashimoto thyroiditis, Graves disease
TSH receptor (TRAb)	Graves disease
Thyroglobulin antibodies	Autoimmune thyroid disease
Anti-transglutaminase	
Anti-tTG (tissue transglutaminase)	Coeliac disease
Anti-eTG (epidermal transglutaminase)	Dermatitis herpetiformis
Rheumatoid factor (RF)	Rheumatoid arthritis (high rate of false positives in SLE and other conditions)
Lupus anticoagulant	
Anti-thrombin antibodies	SLE

[a]See also Table 18.3.