

# Clinical Surgery



# Clinical Surgery

SECOND EDITION

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# Preface

*Clinical Surgery* in its new edition is much more than a facelift. It is the outcome of a major collective effort based on regular meetings of the five editors with the publishers at which format, content and layout were discussed. Admittedly, completion of the second edition has taken longer than anticipated, but the delay has been worthwhile. Although the basic structure of the first edition has been retained, the rewrites, alterations and new material have been based on feedback from our readers specially commissioned by our publishers before work on the second edition commenced in earnest. The needs and comments expressed by students and house officers who took part in the feedback on each and every chapter (favourable or otherwise) were kept firmly in mind by the authors and editors during the redrafting process. Consequently, the editors are confident that all defects and criticisms have been met and the second edition has no serious shortcomings.

In addition to this we have introduced some new features, which we regard as important in the continuous acquisition of medical and surgical knowledge that is based on reading, clinical observation and practice. Perhaps the most relevant of these are the *Must know* (core knowledge information), *Must do* (necessary clinical and humanistic skills) appropriate to each chapter. These provide evidence to the reader of landmark achievements of knowledge and goals in the learning process. When

indicated, we have included references to evidence-based medical practice but shied away from any extensive bibliography.

New material, previously not covered or dealt with in too superficial a manner in the first edition has been added or enhanced without a material increase in the size of the book. In achieving this, we have not sacrificed any of the good features of the book including the *At A Glance* boxes, which have been so popular as *aides-mémoire* with the medical undergraduates in particular.

We trust the second edition of *Clinical Surgery*, like its predecessor, proves to be useful to students, house officers and senior house officers, that it will incite them to consider a career in surgery, but if not, that they benefit as doctors from reading the book. If the second edition achieves the last, we as editors would be well pleased with the outcome of our work.

We would like to thank Alice Emmott, Senior Production Editor, for her forbearance and tact and the entire team at Blackwell Publishing. Also, the authors, you all did a magnificent and expeditious job.

*Alfred Cuschieri*  
*Pierce Grace*  
*Ara Darzi*  
*Neil Borley*  
*David Rowley*

# List of abbreviations

AAA	abdominal aortic aneurysm	DSA	digital subtraction arteriography
ABI	ankle/brachial index	DTPA	diethylenetriaminepentaacetic acid
ACTH	adrenocorticotrophic hormone	DVT	deep vein thrombosis
ADH	antidiuretic hormone	EBV	Epstein–Barr virus
ADL	activities of daily living	ECG	electrocardiogram, electrocardiography
AF	atrial fibrillation	EDTA	ethylenediaminetetraacetic acid
AFP	$\alpha$ -fetoprotein	EEG	electroencephalography
AIDS	acquired immunodeficiency syndrome	EMG	electromyography
ALT	alanine aminotransferase	ENT	ear, nose and throat
APACHE	Acute Physiology and Chronic Health Evaluation	EPVF	extrapulmonary ventilatory failure
APTT	activated partial thromboplastin time	ERCP	endoscopic retrograde cholangiopancreatography
ARDS	acute respiratory distress syndrome	ESR	erythrocyte sedimentation rate
ARF	acute renal failure	ESRD	end-stage renal disease
ASA	American Society of Anesthesiologists	ESWL	extracorporeal shock-wave lithotripsy
AST	aspartate aminotransferase	EUS	endoscopic ultrasonography
ATLS	advanced trauma life support	FAP	familial adenomatous polyposis
ATN	acute tubular necrosis	FEV <sub>1</sub>	force expiratory volume in 1 s
AVM	arteriovenous malformation	FFP	fresh frozen plasma
AZT	azidothymidine	<i>F</i> <sub>IO<sub>2</sub></sub>	fractional inspired oxygen concentration
BCC	basal cell carcinoma	FVC	forced vital capacity
BCG	bacillus Calmette–Guérin	GABA	$\gamma$ -aminobutyric acid
BPH	benign prostatic hypertrophy	GFR	glomerular filtration rate
CABG	coronary artery bypass grafting	GORD	gastro-oesophageal reflux disease
CARS	compensatory anti-inflammatory response syndrome	$\gamma$ -GT	$\gamma$ -glutamyltransferase
CBV	circulating blood volume	GvHD	graft vs. host disease
CDH	congenital dislocation of the hip	HAFLOE	high-airflow oxygen enrichment
CJD	Creutzfeldt–Jakob disease	HAV	hepatitis A virus
CMV	cytomegalovirus; controlled mandatory ventilation	HBV	hepatitis B virus
CNS	central nervous system	HCC	hepatocellular carcinoma
CO	cardiac output	HCV	hepatitis C virus
COPD	chronic obstructive pulmonary disease	HDL	high-density lipoprotein
COX	cyclooxygenase	HDU	high-dependency unit
CPAP	continuous positive airways pressure	HIV	human immunodeficiency virus
CPK	creatine phosphokinase	HLA	human leukocyte antigen
CPR	cardiopulmonary resuscitation	HPP	human pancreatic polypeptide
CRP	C-reactive protein	HR	heart rate
CSF	cerebrospinal fluid	5-HT	5-hydroxytryptamine
CT	computed tomography	HTLV	human T-cell leukaemia virus
CVP	central venous pressure	ICP	intracranial pressure
DIC	disseminated intravascular coagulation	ICU	intensive care unit
2,3-DPG	2,3-diphosphoglycerate	IL	interleukin
DPL	diagnostic peritoneal lavage	INR	international normalized ratio
		IPSID	immunoproliferative small intestinal disease
		ITP	immune thrombocytopenic purpura

IVU	intravenous urogram	PTH	parathyroid hormone
JVP	jugular venous pressure, jugular venous pulse	PUJ	pelviureteric junction
LDH	lactate dehydrogenase	RA	rheumatoid arthritis
LDL	low-density lipoprotein	RBF	renal blood flow
LHRH	luteinizing hormone-releasing hormone	RF	radiofrequency
LOS	lower oesophageal sphincter	RPLND	retroperitoneal lymph node dissection
LPS	lipopolysaccharide	RRT	renal replacement therapy
LSBO	long-segment Barrett's oesophagus	RTA	road traffic accident
MALT	mucosa-associated lymphoid tissue	SAH	subarachnoid haemorrhage
MCH	mean corpuscular haemoglobin	SBP	spontaneous bacterial peritonitis
MCP	metacarpophalangeal	SCC	squamous cell carcinoma
MCV	mean corpuscular volume	SIGN	Scottish Intercollegiate Guidelines Network
MEN	multiple endocrine neoplasia	SIMV	synchronized intermittent mandatory ventilation
MHC	major histocompatibility complex	SIRS	systemic inflammatory response syndrome
MNG	multinodular goitre	SLE	systemic lupus erythematosus
MODS	multiple organ dysfunction syndrome	SPECT	single-photon emission computed tomography
MRA	magnetic resonance angiography	SSBO	short-segment Barrett's oesophagus
MRCPC	magnetic resonance cholangiopancreatography	SSEP	somatosensory evoked potential
MRI	magnetic resonance imaging	SSI	surgical site infection
MRSA	methicillin-resistant <i>Staphylococcus aureus</i>	STD	sexually transmitted disease
MUGA	multiple gated acquisition	STN	solitary thyroid nodule
NGU	non-gonococcal urethritis	SV	stroke volume
NO	nitric oxide	TENS	transcutaneous electrical nerve stimulation
NSAID	non-steroidal anti-inflammatory drug	TGF	transforming growth factor
OA	oesophageal atresia	TIA	transient ischaemic attack
OGD	oesophagoduodenoscopy	TLC	total lung capacity
OPSI	overwhelming postsplenectomy infection	TNF	tumour necrosis factor
Paco <sub>2</sub>	partial pressure of arterial carbon dioxide	TNM	tumour, regional nodes, distant metastases
Pao <sub>2</sub>	partial pressure of arterial oxygen	TOE	transoesophageal echocardiography
PCV	packed cell volume	TOF	tracheo-oesophageal fistula
PCWP	pulmonary capillary wedge pressure	t-PA	tissue plasminogen activator
PE	pulmonary embolism	TPN	total parenteral nutrition
PEEP	positive end-expiratory pressure	TPO	thyroid peroxidase
PEFR	peak expiratory flow rate	TRUS	transrectal ultrasound
PET	positron emission tomography	TSH	thyroid-stimulating hormone
PGL	primary gastric lymphoma	TURP	transurethral resection of the prostate
POSSUM	Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity	UTI	urinary tract infection
PPI	proton pump inhibitor	VAC	vacuum-assisted closure
PPV	patent processus vaginalis	VC	vital capacity
PSA	prostate-specific antigen	VIP	vasoactive intestinal polypeptide
PT	prothrombin time	VSD	ventricular septal defect
		WCC	white cell count
		WHO	World Health Organization

# History-taking and Physical Examination

# 1

# 01

Introduction, 1  
Clinical presentation, 1

The history, 2  
Physical examination, 5

Examination of specific anatomical areas, 9

## Must know Must do

### Must know

Symptomatology and signs of common surgical disorders that present electively  
Presentation and physical findings of common surgical emergencies

### Must do

Take histories of patients with surgical disorders:  
learn by experience how to establish rapport with patients  
Examine patients with surgical disorders: head and neck, chest, abdomen, limbs and genitalia  
Perform rectal examinations under supervision  
Acquire skill and experience in performing common clinical procedures, e.g. insertion of intravenous lines, insertion of nasogastric tubes, injections, setting up drips, catheterization of the urinary bladder (male and female)  
Examine the locomotor system of patients  
Attend outpatient general surgical clinics  
Attend fracture clinics

## Introduction

The mastery of clinical skills is different from knowing how the various clinical tasks are performed. This expertise has several components, including the ability to:

- communicate freely and efficiently with patients and colleagues;
- detect abnormal physical signs, e.g. an enlarged liver, rebound tenderness;
- recognize acute and life-threatening situations;
- perform common clinical procedures with proficiency;
- confirm normality when present.

No amount of encyclopaedic knowledge gained from reading and lectures can ever impart clinical competence. The requirements for proficiency as a doctor are core knowledge of the common medical and surgical disorders and full clinical competence. Rare and obscure illnesses will be encountered by every clinician from time to time.

One needs only to be aware of these disorders since the competent doctor will recognize that the patient does not fit any of the common disease patterns and will seek advice or expert opinion.

## Clinical presentation

Patients may present in two ways:

- *electively*, with chronic symptoms of variable duration; or
- *acutely*, with life-threatening disorders.

The pathways involved in management of the two are quite different.

In the elective (cold) situation, the surgeon proceeds as shown in Table 1.1. If surgical treatment is required, the patient is usually put on the waiting list or is given a date for the operation at the time of the outpatient interview. A priority system based on disease severity is adopted in deciding which patients are operated on soon after the diagnosis is confirmed. Thus a patient with cancer takes precedence over a patient with an uncomplicated inguinal hernia. Cancer patients undergo a process of staging by appropriate investigations based on the TNM (tumour, regional nodes, distant metastases) system before the relevant treatment is selected. This staging process influences management in several ways. In some patients, the disease is found to be inoperable, when non-surgical treatment (chemotherapy, radiotherapy) may be employed. In others, the disease, though operable, is advanced and adjuvant therapy (endocrine, chemotherapy, radiotherapy) before or after surgery is needed in addition to surgical extirpation of the primary tumour. Staging (clinical and

**Table 1.1** Management of the elective patient.

Establish the diagnosis and confirm it, whenever necessary, by the appropriate investigations
Decide on the nature of the treatment required: surgical or medical
Impart this information to the patient and carry out the treatment if the patient consents to this

**Table 1.2** Management of the acutely ill patient.

---

Prompt diagnosis and assessment of the condition  
Resuscitation (**A**irway, **B**reathing, **C**irculation; see Chapters 11 and 12)  
Decision on treatment: emergency surgical intervention or conservative management with close clinical observation

---

**Table 1.3** Priorities in the management of the acutely injured patient.

- 
- A** Airway
  - B** Breathing
  - C** Cardiovascular system
  - D** Neurological Defects
  - E** Exposure to detect all injuries
- 

pathological) is also the best overall guide to prognosis in the individual patient.

Acute patients are admitted as emergencies with life-threatening disorders or trauma. The pathway of management in these patients is shown in Table 1.2. Frequently, resuscitation and diagnosis go hand in hand in the seriously ill or injured patient. Prompt and efficient resuscitation of seriously ill patients, which necessitates an understanding of the underlying pathophysiological mechanisms (see Chapters 11–16), is crucial to the survival of these patients. Not all acute conditions need surgical intervention and some are managed conservatively in the first instance, with recourse to surgery if progress is not made or the clinical condition deteriorates. The relief of acute pain by appropriate analgesia (see Chapter 8) is a very important part of the clinical management of acutely ill patients, whether they need emergency surgery or not.

In the management of trauma victims, the priorities in order of precedence are shown in Table 1.3.

## The history

Much has been written about the technique of history-taking. For most individuals this is an acquired attribute. Basic to successful history-taking is the ability to establish a rapport with the patient, allowing him or her to relate the story (history) of the illness. In essence, history-taking is the art of conversation and requires a fine balance between listening and interjecting with relevant questions to clarify points and obtain details as the history unfolds (Table 1.4).

In this process there are dos and don'ts. The only way a student can verify that an accurate history has been obtained is to summarize the information for the patient

**Table 1.4** Approach to history-taking.

---

Establish a rapport with the patient: introduce yourself, shake hands  
Initiate the process by asking the patient to tell you what made him or her seek medical advice  
Listen without interruption to the patient as he or she relates the history of the presenting complaint(s). During this process make a mental note of the key symptoms  
Wait for the answer before asking another question  
Obtain further details on specific symptoms, including duration, nature of severity and associations, by specific questions  
Briefly review the systems by key questions  
Obtain details of past medical history, including drug medication, surgical conditions, operations and exposure to general anaesthesia. Past medical incidents are important because they may relate to the patient's current illness and may also influence management  
Obtain details of social history and habits, including alcohol consumption and smoking  
Obtain a brief family history

---

**Table 1.5** Don'ts of history-taking.

---

Do not interrupt the patient  
Do not use medical terminology  
Do not ask ambiguous or irrelevant questions  
Do not use leading questions in the first instance  
Do not be abrupt or impatient

---

to confirm. This provides a valid check of the accuracy of the history-taking process and is highly recommended until full proficiency in history-taking is obtained. The wrong information can be obtained if the technique is poor and the patient is confused by the interviewer. In this respect one should avoid the mistakes outlined in Table 1.5.

## Symptoms

Patients can present with specific or non-specific symptoms or a combination of both. Specific symptoms are those that relate to disease in specific organs, e.g. difficulty with swallowing (dysphagia), indicating disorders of deglutition or organic narrowing of the oesophagus. Each system has its own specific symptoms, although there is considerable overlap (Table 1.6).

Patients vary considerably in their clinical presentation. Although a few present with all the characteristic symptoms of a specific illness (classical presentation or 'full-house'), in the majority of patients the history is not

**Table 1.6** Specific symptoms.

*Nervous system:* headache, nausea and vomiting, visual disturbances, motor defects (paralysis), incoordination, sensory loss and disturbances (paraesthesiae), altered levels of consciousness

*Respiratory system:* cough, expectoration, breathlessness, wheezing, chest pain, diminished exercise tolerance

*Cardiovascular system:* loss of consciousness (syncope), breathlessness, diminished exercise tolerance, retrosternal chest pain, intermittent pain in limbs on walking (intermittent claudication), rest pain in the limbs, gangrene (necrosis of tissue)

*Hepatobiliary–pancreatic system:* nausea and vomiting, pain, jaundice, itching, bleeding tendency, weight gain due to water retention, weight loss

*Gastrointestinal system:* loss of appetite (anorexia), nausea and vomiting, difficulty in swallowing, indigestion, abdominal pain, altered bowel habit (diarrhoea and/or constipation), blood in vomit (haematemesis), passage of slime and fresh or altered blood in the faeces

*Genitourinary system:* loin pain, fever, suprapubic pain, frequency, painful micturition (dysuria), micturition at night (nocturia), poor stream, dribbling and incontinence, blood in urine (haematuria), enlarged or tender testis

typical and the clinician has to decipher the situation. The ability to identify specific symptoms is one of the reasons for the increasing diagnostic efficiency that comes with clinical experience. Non-specific symptoms do not immediately give a clue to the diagnosis or site of disease. In this situation, a tentative diagnosis is made on the history as a whole. In this group of patients more reliance is placed on investigations in establishing the diagnosis.

## Common important symptoms in general surgery

### Pain

Pain is the most common and important symptom in surgical practice. (It used to be said with some truth that pain and blood were the only two events that brought patients quickly to the doctor.) Pain is universal and can be caused by benign or malignant disorders and elective or acute conditions. It is the symptom that is least commonly overlooked by patients, although the threshold for pain varies considerably from one person to another. The information required to establish the clinical significance of pain is shown in Table 1.7.

**Table 1.7** Diagnostic clinical information on pain.

Site  
Radiation  
Severity  
Nature  
Duration  
Relieving factors  
Aggravating factors  
Associations

The most reliable way to obtain precise information on the location of pain is to ask the patient to point to the exact site of the pain and where it radiates. Pain may be localized or diffuse and can be referred. Localized pain is either musculoskeletal in origin or is indicative of disease, trauma or inflammation in the affected region. Pain may be referred to the corresponding sensory dermatome. This is exemplified by shoulder tip pain due to a subphrenic abscess causing irritation of the ipsilateral phrenic nerve.

### Types of pain

- *Colicky pain* is indicative of an obstructed hollow organ. It is gripping in nature and fluctuates, with peaks of intensity followed by partial or complete relief before a further bout occurs. Colicky pain is always severe and makes the patient restless. The patient rolls about in agony, unable to find a comfortable position. It is usually accompanied by nausea and vomiting.
- *Somatic pain*, i.e. the severe pain due to inflammation of the parietal peritoneum from localized or general peritonitis, is aggravated by movement. The patient lies still and breathes shallowly to diminish abdominal wall excursion with respiration (e.g. perforated peptic ulcer) or assumes a position that releases tension on the abdominal musculature, i.e. draws the knees up, a posture often observed in patients with acute pancreatitis. The pain of acute peritonitis is also aggravated by coughing.
- *Burning pain* signifies mucosal injury/inflammation and is typified by the heartburn of reflux oesophagitis, the burning indigestion encountered in patients with peptic ulceration (see Chapter 26) and the dysuria that accompanies inflammation of the urinary bladder (cystitis; see Chapter 39).
- *Intermittent claudication* is the term used to signify cramp-like pain in the muscles of the lower limbs (usually calf, but may involve the thighs and gluteal regions) that develops with walking and subsides with rest, after which the patient can resume walking before the pain comes on again. It is caused by peripheral occlusive vascular disease (atherosclerosis), with a resultant defective blood supply

leading to the accumulation of metabolites such as lactic acid on exertion. The claudication distance (the distance the patient can walk before the onset of muscle cramps) reflects the severity of the peripheral vascular disease (see Chapter 37).

- *Rest pain* is a much more serious type of vascular pain. The patient experiences pain in the affected limb at rest. The pain is severe, constant and interrupts sleep. Some relief is obtained by dangling the affected limb over the edge of the bed. Rest pain denotes threatened viability of the limb and requires urgent vascular treatment to prevent the development of gangrene (see Chapter 37).

- *Root pain* is caused by irritation of the spinal dorsal roots and can be caused by compression (vertebral collapse) or direct malignant involvement. The pain radiates from the back around the body, usually on either side, in the distribution of the respective dermatomes. It is often accompanied by both sensory changes (paraesthesiae) and motor changes (muscle weakness/paralysis, bladder dysfunction). Pain due to inflammation, partial injury or neoplastic involvement of nerves or nerve roots is known as *neuralgia*. It is always severe, often intractable and requires special measures that may include neurosurgical intervention (see Chapter 40).

## Indigestion

*Indigestion* or *dyspepsia* are loosely defined words that denote epigastric discomfort or pain occurring either during fasting or during or after meals and indicate disease within the upper digestive and biliary tract. The practical problem encountered with these symptoms relates to the frequency with which normal individuals experience indigestion. One study has shown that 70% of people living in the UK experience episodes of indigestion and heartburn from time to time and reports from other western countries indicate a similar prevalence. The key issue in clinical practice is what constitutes abnormal indigestion. This is difficult to define and for this reason diagnosis of serious conditions, such as gastric cancer, is often delayed as the general practitioner usually prescribes medication designed to produce symptomatic relief. Meanwhile the tumour progresses and is often incurable by the time the diagnosis is made. Thus in most western countries 90% of all gastric cancers are advanced at the time of presentation. There are certain practical considerations related to dyspepsia that must never be overlooked and which require investigation by endoscopy rather than empirical symptomatic treatment (Table 1.8). From the symptomatic viewpoint, dyspepsia is often classified into:

- ulcer dyspepsia;
- reflux dyspepsia;
- malignant dyspepsia;

**Table 1.8** Indications ('alarm symptoms') for upper gastrointestinal endoscopy.

---

Frequent or persistent indigestion irrespective of age
Indigestion accompanied by other gastrointestinal symptoms
Indigestion with anorexia and/or weight loss
<i>Helicobacter pylori</i> -negative dyspepsia
Indigestion occurring for the first time in a patient above the age of 40 years

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- non-ulcer dyspepsia;
- gallbladder dyspepsia.

## Dysphagia

Dysphagia signifies inability to swallow and may be caused by motility disorders or organic disease that encroaches on the lumen of the oesophagus, such as stricture or neoplasm (see Chapter 25). This symptom always warrants urgent investigation by flexible endoscopy and a barium swallow. The difficulty in swallowing may be experienced in relation to liquids and solids. In some patients with inflammatory mucosal disease, the dysphagia is accompanied by pain. This symptom complex is known as *odynophagia*. Dysphagia due to organic disease is progressive and without treatment the patient may eventually be unable to swallow saliva due to complete occlusion of the oesophageal lumen. Dysphagia caused by motility disorders such as achalasia (see Chapter 25) may be intermittent. High dysphagia due to bulbar palsy or cricopharyngeal spasm is accompanied by spluttering and choking as the bolus, unable to negotiate the upper oesophageal sphincter, spills over into the larynx.

In the presence of significant oesophageal occlusion, dysphagia is accompanied by *regurgitation*, which is passive and effortless as opposed to vomiting. In patients with dysphagia, spillage of retained food debris in the dilated oesophagus across the cricopharyngeus into the larynx may occur in the supine position during sleep, leading to aspiration and pneumonitis. This accounts for the chronic productive cough and fever encountered in patients with long-standing dysphagia.

## Anorexia and weight loss

Anorexia denotes loss of appetite. This may be due to an abnormal psychiatric state, e.g. anorexia nervosa, although in surgical patients loss of appetite is usually caused by malignant neoplasms, usually of the upper digestive tract and pancreas. Anorexia must be distinguished from fear of eating because of precipitation of symptoms or inability to eat consequent on a disordered swallowing mechanism

from any cause. Anorexia is invariably accompanied by weight loss due to diminished protein–calorie intake. However, there are other causes of weight loss. Some malignant tumours are accompanied by the development of a catabolic state such that the weight loss is out of proportion to the reduced dietary intake (*cachexia*).

Some patients lose weight because they are unable to assimilate ingested food. This may be the result of impaired digestion of foodstuffs (e.g. diminished pancreatic enzymes in chronic pancreatitis), reduced bile salt pool from any cause (malabsorption of fats), bacterial overgrowth, intrinsic disease of the small-bowel mucosa (coeliac disease, brush-border enzyme deficiencies), disorders affecting the small bowel (Crohn's disease) or extensive resection of the small intestine (short gut syndrome).

## Vomiting

Vomiting is an active process, involving violent contractions of the abdominal musculature that forcibly expel the gastric contents in a retrograde fashion. During vomiting the lower oesophageal sphincter and the cricopharyngeus are reflexly opened and the glottis is closed. In surgical practice, vomiting may have a cerebral cause, such as raised intracranial pressure due to a space-occupying lesion. More commonly, however, it is the result of acute intra-abdominal disease or obstruction of hollow organs. Thus, nausea and vomiting may be a feature of such diverse conditions as acute appendicitis, acute gastritis (drug or alcohol induced), exacerbation of peptic ulceration, acute pancreatitis, renal and biliary colic. Vomiting is a predominant feature of an obstructed stomach (pyloric stenosis).

The nature of the vomit is important. In obstructions proximal to the pylorus, the vomit does not contain bile. Vomiting of blood (*haematemesis*) is encountered in bleeding lesions of the lower oesophagus, stomach and duodenum. The blood may be fresh or dark and 'coffee-ground' in appearance as a result of digestion by hydrochloric acid and pepsin in the stomach. In pyloric stenosis, the vomit often contains portions of food that the patient had ingested several hours, sometimes days, beforehand. In some of these patients, the vomiting may be self-induced in an effort to relieve the upper abdominal discomfort caused by a distended stomach.

Vomiting in the unconscious state (e.g. head injury, alcoholic stupor and during recovery from general anaesthesia) is particularly dangerous in view of the distinct possibility of inhalation of vomit into the tracheo-bronchial tree, with severe pulmonary damage and the development of acute (formerly referred to as adult) respiratory distress syndrome (see Chapters 11 and 38).

Vomiting is a major clinical presentation of acute small-bowel obstruction (Chapters 15 and 31), where it is accompanied by variable abdominal distension and constipation.

## Altered bowel habit

Strictly speaking, this term is applied to patients with previously regular bowel habits who suddenly develop constipation, diarrhoea or diarrhoea alternating with constipation. This is a feature of some but not all patients who develop a colonic neoplasm in the left colon or upper rectum. The difficulty lies in establishing what was normal for the patient beforehand. Because of the diminished dietary intake of fibre in western countries, constipation and low-bulk stools are undoubtedly very common, as are disorders of colonic transit (diverticular disease, slow-transit constipation). There is also a tendency towards constipation with increasing age.

In patients with rectal or lower sigmoid carcinoma, the constipation may also be accompanied by a feeling of incomplete evacuation after defecation. This is often referred to as *tenesmus*. Other symptomatic accompaniments in these patients include the passage of mucus and rectal bleeding, which is mixed with the motion.

Bloody diarrhoea is a feature of colonic inflammatory bowel disease and infective colitis. Diarrhoea may also signify the presence of colonic motility disorders, exemplified by irritable bowel syndrome. This common obscure condition can also present with constipation.

Foul-smelling diarrhoea that floats and is difficult to flush away is encountered in malabsorption. Because the faeces contains a large amount of fat, the term *steatorrhoea* is often used in this condition. Passage of foul-smelling tar-like liquid or solid motion (*melaena*) indicates a proximal source of bleeding in the gastrointestinal tract.

## Physical examination

### General principles

Physical examination must be thorough and efficient without being overdone and exhausting to the patient. Whichever system or anatomical region is examined, the process relies on four skills, i.e. *inspection*, *palpation*, *percussion* and *auscultation*, and is designed to elicit the appropriate clinical signs. Whereas examination of the various systems is crucial to the management of patients with medical disorders, in surgical practice physical examination is more commonly focused on anatomical regions (head and neck, ear, nose and throat, breasts, abdomen and limbs), although assessment of the respiratory, cardiovascular and renal systems is often also necessary. Certain vital signs such as temperature, blood pressure,

pulse rate, pulse volume and respiratory rate are performed routinely in all but minor cases.

## Inspection

Inspection requires a trained eye actively to detect abnormalities. Inspection consists of a detailed and systematic scrutiny of the anatomical region and entails close observation of abnormal movements of the parietes and body contour, as well as surface abnormalities (scars, surface lesions, lumps, bulges) and complexion of the skin, lips, conjunctival membranes and sclera. Good lighting is essential, particularly for the detection of abnormal discoloration (pallor, cyanosis, jaundice).

## Palpation

Palpation relies on the tactile sense organs in the fingers to outline surface irregularities, tension of the abdominal walls, lumps and enlarged organs. The exercise should be carried out by a relaxed warm hand and should be conducted gently and in an orderly fashion. In general, the more you press, the less you feel, and worse still, the patient is hurt.

## Percussion

Percussion is very useful for establishing the consistency of a swelling or organ. Thus a solid lump or organ is *dull* to percussion. A fluid-containing cyst or body cavity (peritoneal, thoracic) is *stony dull* to percussion. For the same reason a distended urinary bladder is detected as a localized dull swelling in the suprapubic region. By contrast, air-containing organs (normal ventilated lung, air-containing hollow abdominal viscera) are *resonant* on percussion (much like a drum). When using percussion

to outline the size or margins of an organ, one should percuss from the resonant to the dull area. The point where the note changes marks the margin of the organ.

## Auscultation

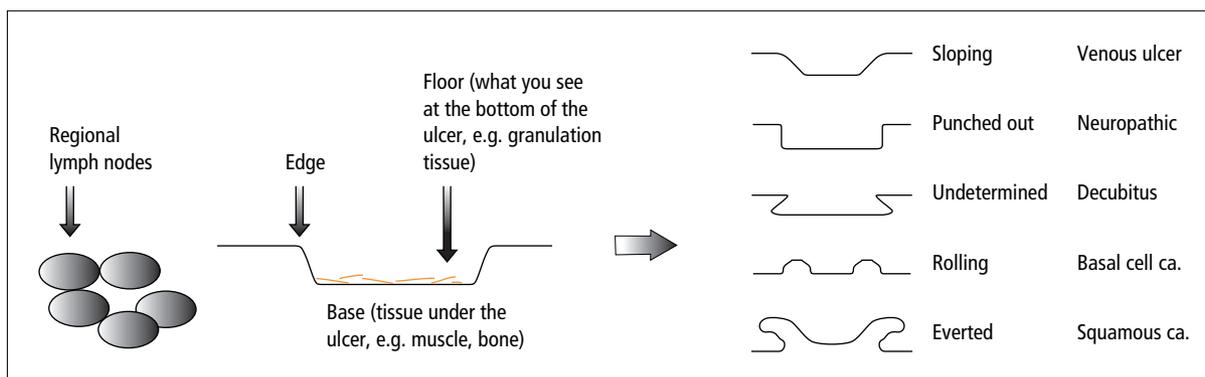
Auscultation with the stethoscope requires considerable experience to recognize the normal from the abnormal, and is used to examine the lungs (normal and adventitial breath sounds), heart sounds and murmurs, abdominal bowel sounds, and bruits over stenotic or dilated segments (aneurysms) of arteries.

## Examination of an ulcer

An ulcer is defined as an area of discontinuity of the surface epithelium and may occur internally (mucosal) or externally, when it involves the skin and subcutaneous tissues. Ulceration has a varied aetiology and ulcers may be benign or malignant in nature. In establishing the nature of an ulcer, certain characteristics are important, including the site of the ulcer, its floor, and its base and edges (Fig. 1.1). The history is also important and often provides useful diagnostic clues. The duration of the ulcer, history of trauma and the presence or absence of pain are all relevant.

## Floor of an ulcer

The floor of an ulcer is made up of fibrovascular granulation tissue. If this consists of healthy pink granulations, the ulcer has an excellent chance of healing. By contrast, healing is compromised if the floor is covered by grey slough and pale granulation tissue, e.g. neuropathic or trophic ulcers. These are deep penetrating ulcers found on pressure areas of the feet in patients with absent or



**Figure 1.1** Anatomy of an ulcer. The important characteristics to establish with any ulcer are the site, size, shape, floor, base, edge, discharge, surrounding skin and regional lymph nodes.

diminished sensation due to peripheral neuropathy from any cause (often diabetes). They are characteristically painless because of the anaesthesia involved in their aetiology, since they are attributable in part to repeated unrecognized trauma. Ischaemic ulcers have virtually no granulation tissue and may expose underlying structures such as tendons, muscles and periosteum. They usually require limb revascularization (by arterial surgery to restore blood flow to the limb) and sometimes skin grafting.

### Base of an ulcer

The base of an ulcer refers to the state of the tissues underneath and around the floor of the ulcer. If there is inflammatory involvement, the surrounding tissues feel indurated and the ulcer appears fixed and is tender. Fixation and induration may be the result of neoplastic infiltration of the deeper tissues if the ulcer is malignant. In this instance, fixation is not accompanied by tenderness.

### Edge of an ulcer

The edge of an ulcer is often indicative of the nature of the lesion.

- *Sloping blue edges* indicate advancing epithelium (over the red granulation tissue) and signify healing. Blue healing edges are often encountered in venous (gravitational) ulcers.
- *Punched-out* ulcers with sharp edges used to be characteristic of syphilis in the days before antibiotics. These have virtually disappeared from clinical practice nowadays and a more typical example of a punched-out ulcer is the neuropathic ulcer due to peripheral neuropathy, most commonly encountered in diabetic patients.
- *Undermined edges* are typical of decubitus ulcers (pressure sores) and tuberculous ulcers which, though rare in the West, are still common in developing countries. Decubitus ulcers are the result of poor medical and nursing care of patients confined to bed for prolonged periods as a result of illness or operation. These ulcers are caused by compression necrosis of the skin and subcutaneous tissues over pressure points: heels, sacral region, scapular region. Decubitus ulcers are largely preventable by ensuring clean soft bedding and frequent turning of these immobile patients.
- *Rolled or everted edges* are seen when central ulceration is accompanied by growth at the edges and are characteristic of malignant ulcers such as basal cell carcinoma (see Fig. 36.12) and squamous cell carcinoma (see Fig. 36.13) of the skin. Eversion of the edges is more prominent in squamous carcinomas than in basal cell lesions, where the edges are gently rolled and the floor is often encrusted.

### Site of an ulcer

The site of an ulcer may be a clue to the diagnosis. Examples of this include the predilection of basal cell lesions for the upper third of the face and forehead, occurrence of venous ulcers around the medial malleolus, frequency of ischaemic ulcers on the anterior aspect of the shin and dorsum of the foot, location of trophic ulcers on the sole of the forefoot (especially underneath the ball of the big toe) and common occurrence of decubitus ulcers in the sacral region.

### Other characteristics

While some ulcers are dry, a discharge is a common feature and may be thin and serosanguineous or thick and purulent if the ulcer is infected. If a discharge is present, a swab should be taken for culture and sensitivity testing. The regional lymph nodes are often enlarged due to infection, although the lymphadenopathy may be due to metastatic spread in the case of squamous cell carcinomas. If the nature of an ulcer remains in doubt after clinical examination, a biopsy with histological examination is essential. The biopsy taken is a wedge that includes a portion of the floor, the edge of the ulcer and adjacent normal skin.

### Examination of a lump or swelling

A lump may be visible on inspection or not be detected until palpation is carried out. The lump may be discrete and localized or be diffuse, when it is more properly designated a swelling. The important features that provide diagnostic information are site, anatomical plane, relationship to adjacent structures, temperature, tenderness, consistency, mobility, fluctuation, pulsatility (expansile, transmitted) and state of regional lymph nodes. In addition, specific lumps have additional characteristics that can be demonstrated by appropriate clinical tests.

### Position, location, shape and size

The first feature that should be noted is the position of the lump and its relationship to adjacent anatomical structures, the plane of location (subcutaneous, intramuscular, intra-abdominal, etc.). A lump that is superficial to a muscular compartment, e.g. situated in the subcutaneous plane, is rendered more prominent when the patient is made to contract the relevant muscles. By contrast, this manoeuvre makes a lump become less distinct on both inspection and palpation if the lesion lies within or beneath a muscular compartment. In subcutaneous swellings, it is often possible to 'pinch' the skin over the

summit of the lesion. This cannot be achieved with intracutaneous lumps such as sebaceous cysts. During this stage of the examination, a note is also made of the shape and size (in two diameters) of the lump. Size is important in planning surgical excision and in the assessment of the effect of non-surgical therapy for inflammatory and neoplastic lesions.

### Inflammatory characteristics

Palpation of a lump should be carried out gently and, initially, the temperature of the lesion and the presence of any tenderness noted. Surface discoloration (erythema, bruising, etc.) should also be noted.

An inflammatory swelling will be tender, hot, erythematous, indurated and oedematous. It is important to note, however, that some rapidly growing malignant neoplasms may exhibit an inflammatory appearance virtually indistinguishable from that caused by infective conditions. This is encountered most commonly in the breast, where differentiation between a breast abscess and inflammatory cancer may be difficult.

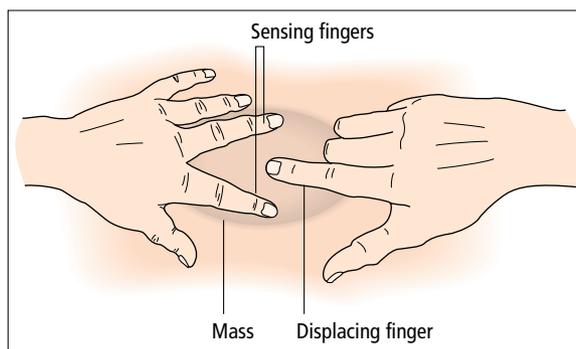
### Mobility

The mobility of a lump is tested in two planes at right angles to each other. For lumps situated over a muscle compartment, contraction of the muscle group is important before mobility is assessed since a lesion may be infiltrating the muscles and still appear to be mobile if the muscle is not contracted. Mobility does not designate a lump as benign. Indeed, many benign lumps exhibit limited mobility because of attachment of anatomical structures (e.g. ganglion, because of its attachment to tendons and joint capsule; goitre, because the thyroid is tethered to the trachea). The majority of neoplastic lesions are mobile in the early stages and become fixed only when they infiltrate surrounding tissues.

### Consistency, dullness and resonance

The feel or consistency of a lump is probably its most important clinical feature. It may be solid and hard (when the possibility of neoplasia arises), tense, soft, cystic, or pulsatile (vascular origin). Most enlarged lymph nodes feel rubbery. Solid and fluid-containing lumps are dull on percussion. Some swellings contain gas or gas-filled viscera, in which case they are resonant.

A superficial fluid-containing cavity or collection is *fluctuant*. The test for fluctuation is simple and is illustrated in Fig. 1.2. Fluctuation is very useful for the detection of non-inflamed localized collections of fluid and blood. Generally speaking, cystic lumps and swellings are soft, although a tense cyst may feel hard. The benign



**Figure 1.2** Test for fluctuation. The index and middle finger of the left hand are placed in a V-shaped configuration on the mass and the index finger of the right hand is used to depress the summit of the mass repeatedly. If fluid is present, the pressure waves created are felt by the sensing left fingers. The test is applied twice, with the second attempt being at right angles to the first. Obviously inflamed and tender masses (e.g. abscesses) should not be subjected to fluctuation as this causes considerable pain.

tumour of fat (lipoma), which often presents as a subcutaneous lump, also fluctuates on testing.

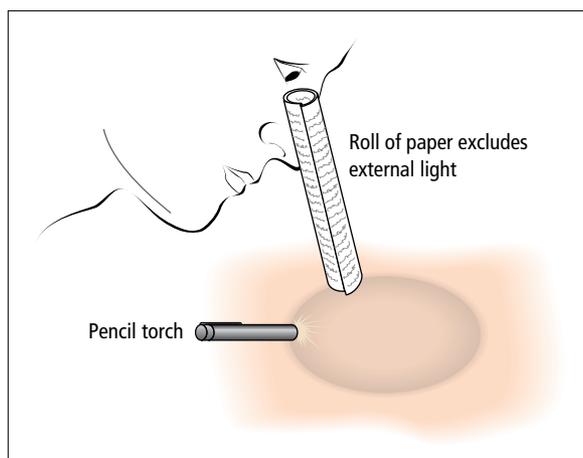
A fluid thrill may be present in some cystic swellings. This may be elicited by tapping one side of the swelling and detecting the transmitted percussion wave with the examining fingers placed on the opposite side of the swelling.

### Transillumination

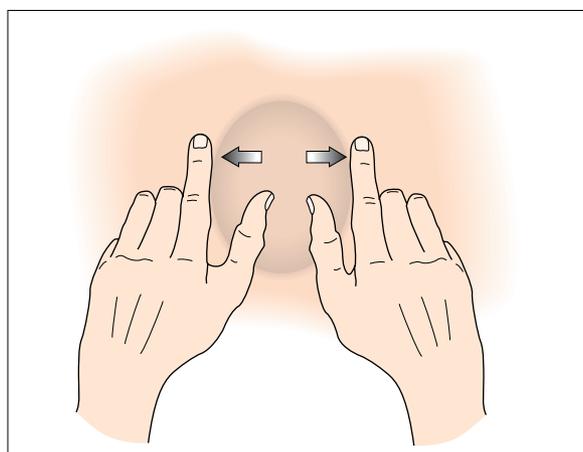
Transillumination involves shining a light through a swelling to detect whether it transmits light brilliantly or not (Fig. 1.3). Transillumination is a function of the optical density of the component elements of the swelling. Thus a cyst containing clear fluid (e.g. hydrocele, cystic hygroma) transilluminates brilliantly, one containing opalescent fluid (spermatocele) less so. Fat (lipoma) and subcutaneous tissues also transilluminate to a varying extent.

### Vascular swellings

A swelling arising from an artery is usually the result of localized dilatation (aneurysm) and demonstrates expansile pulsation. The most common example encountered in clinical practice is abdominal aortic aneurysm, which must be palpated gently because of the risk of rupture. In superficial aneurysms, a vascular thrill caused by the turbulent flow in the aneurysm is felt on palpation. Some non-vascular (solid or cystic) lesions apposed to large arteries transmit arterial pulsations. The differentiation



**Figure 1.3** Test for transillumination of a swelling. Transillumination is elicited by a pencil torch light and a hollow cylinder (made of rolled paper) placed on opposite sides of the swelling. If the swelling contains clear fluid, the light will be transmitted through the fluid and will be seen by the observer looking down the paper cylinder. The cylinder is used to exclude other light from the test region.



**Figure 1.4** To elicit expansile pulsation (i.e. an aneurysm) the index fingers are placed one on either side of the swelling. Separation of the two index fingers occurs synchronously with each systolic impulse.

between expansile and transmitted pulsations is important and requires bidigital palpation, with each index finger placed on either side of the swelling. If the lump is intrinsically pulsatile, the index fingers are separated with each systolic impulse (Fig. 1.4).

Dilated (varicose) veins are obvious on inspection, especially with the patient standing up. When the proximal part of the long saphenous vein is dilated (due to

incompetence at the saphenofemoral junction), it forms a uniform bulge in the immediate subinguinal region and is known as a *saphena varix*. This swelling also exhibits a fluid thrill that is elicited by tapping the vein below the swelling and feeling the impulse with the fingers of the other hand placed over the varix.

## Hernial swellings

The characteristic features of hernial swellings (inguinal, paraumbilical and incisional) are increased prominence with a rise in intra-abdominal pressure (cough, contraction of abdominal musculature, erect posture) and an impulse, visible and palpable, when the patient coughs. There is one important exception to these observations: a femoral hernia usually presents as a subinguinal lump that does not have a cough impulse and does not change in size with change in posture.

## Examination of specific anatomical areas

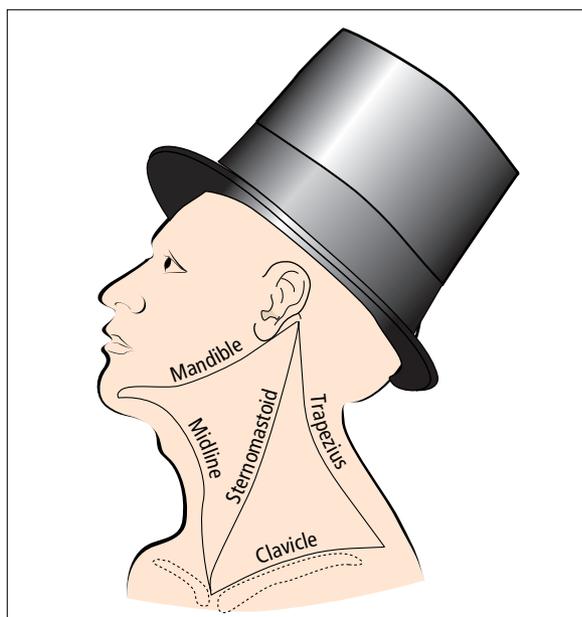
### Examination of the head and neck

#### General aspects and inspection

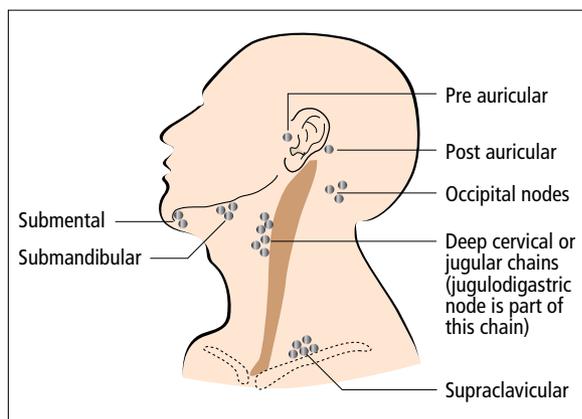
Examination of the head and neck begins with inspection. Lesions and abnormalities of bone structure and soft tissues of the face are obvious but lesions in the scalp are often not apparent except in bald males. Anatomically, the neck is divided into two triangles on either side of the midline (Fig. 1.5). Most abnormalities of the neck are visible as swellings. Size and location should be noted and confirmed later by palpation. Lumps attached to the trachea, e.g. thyroid swellings, move upwards (with the trachea) on swallowing. Central lumps attached to the hyoid bone, such as thyroglossal cysts, move upwards with both swallowing and protrusion of the tongue. The most common lump in the neck is due to cervical lymphadenopathy, which may be inflammatory but is often neoplastic (secondary carcinoma or lymphoma). The anatomical disposition of the cervical lymph nodes is shown in Fig. 1.6.

An important feature of inspection of the head and neck relates to the venous drainage. Abnormal engorgement of the external jugular vein may be indicative of cardiac failure or circulatory overload. In patients with obstruction of the superior vena cava, usually caused by malignant lymphadenopathy in the superior mediastinum (primary or secondary), there is gross engorgement of the head and neck with prominent superficial veins, a congested suffused appearance and evidence of collateral pathways over the anterior chest wall.

Surgical emphysema most commonly appears in the head and neck region as soft crepitant diffuse swelling. It is



**Figure 1.5** Anterior and posterior triangles of the neck. The boundaries of the anterior triangle are the midline, the anterior border of the sternomastoid muscle and the lower border of the mandible. The margins of the posterior triangle are the trapezius, the posterior border of the sternomastoid and the upper border of the clavicle. To determine whether an abnormality is in the anterior or posterior triangle, the sternomastoid muscle should be rendered tense by asking the patient to depress the chin against resistance.



**Figure 1.6** Anatomical disposition of the cervical lymph nodes.

caused by escape of air from lacerations or perforation of the tracheobronchial tree or the oesophagus. The extravasated air tends to occupy and cause swelling of regions with lax tissue planes, such as the supraclavicular and peri-



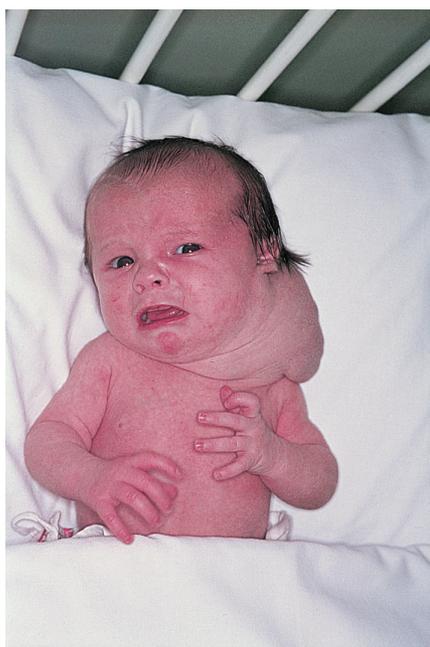
**Figure 1.7** Severe surgical emphysema of the head and neck. This patient was crushed in a lift shaft.

orbital regions. When marked, the resultant swelling leads to virtual occlusion of the eyelids (Fig. 1.7).

## Palpation

Systematic palpation of the scalp is essential to detect lesions in this region. Parting of the hair over a lump identified by palpation enables closer inspection of the lesion. Scalp lesions superficial to the galea aponeurotica move with the scalp when the patient contracts the occipitofrontalis muscle. Lesions deep to this structure or those invading it and the subjacent pericranium are fixed.

Palpation of the anterior triangles of the neck is carried out from the front, whereas palpation of the posterior triangles is best conducted from behind. The entire regions are covered and if an anterior lump is felt, the patient should be asked to swallow and any resulting displacement noted. The consistency of the lump is determined and fluctuation elicited if the swelling appears to be soft and cystic. Transillumination of a large cystic swelling in infants and children, if positive, confirms the presence of cystic hygroma (Fig. 1.8). Palpation of the neck must cover the lymph node groups, especially the deep cervical and the supraclavicular regions. The left supra-clavicular region is a common site for metastatic nodal disease from visceral cancer (oesophagus, stomach and pancreas). The



(a)



(b)

**Figure 1.8** (a, b) Large cystic hygromas both present at birth. Cystic hygromas are large disfiguring lymphangiomas that are treated by surgical excision.

carotid vessels must also be palpated for thrills, associated swellings and any aneurysmal dilatation.

### Percussion

Percussion is seldom employed in examination of the head and neck. It may provide useful information in swellings occupying or extending below the suprasternal notch, when percussion over the manubrium may elicit dullness, indicating probable retrosternal extension of the lump. This is most often encountered with swellings of the thyroid gland. However, it is an imprecise clinical test and is unreliable, especially in patients with chronic obstructive airways disease and emphysema.

### Auscultation

Auscultation is used if the swelling appears to be vascular and is most commonly applicable to patients with toxic enlargement of the thyroid gland (see Chapter 34). A systolic bruit is often present in patients with primary hyperthyroidism. Auscultation of the carotid vessels should be performed routinely in patients above the age of 50 years and is mandatory in patients with a history of fleeting blindness (*amaurosis fugax*) or recoverable attacks of muscle weakness or loss of consciousness. These symptoms are indicative of 'minor strokes', which are referred to as transient ischaemic attacks (TIAs) and are caused by emboli from atheromatous narrowing of the carotid vessels at the bifurcation into external and internal carotid branches. In these patients a carotid bruit is often heard on auscultation (see Chapter 37).

### Cervical lymphadenopathy

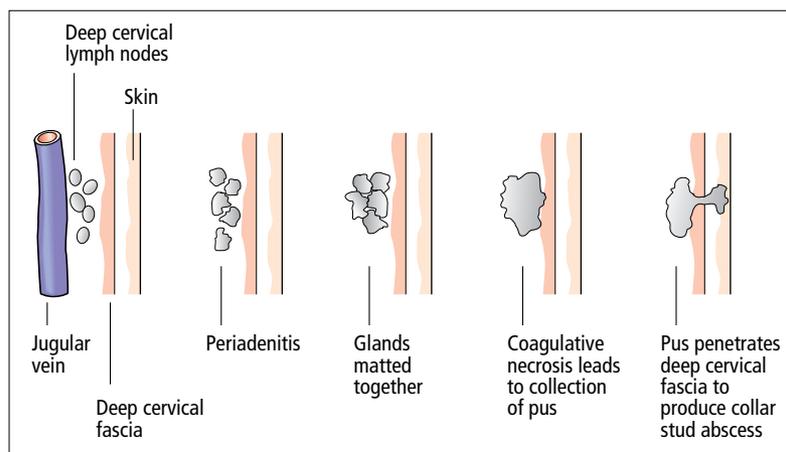
Enlargement of the cervical lymph nodes may be due to infection or neoplastic infiltration. The latter may consist of secondary deposits from a primary tumour elsewhere in the body or be primary in nature, i.e. lymphoma.

Infective conditions may be viral or bacterial, acute or chronic. Examples include tonsillitis, infectious mononucleosis, acquired immunodeficiency syndrome (AIDS), scalp infestations and cat-scratch fever. Pyogenic infections (usually staphylococcal in nature) may form large painful abscesses that require drainage. Cervical cellulitis due to streptococcal infection is fortunately rare nowadays. As the infection is confined by the deep cervical fascia, airway obstruction from pressure and laryngeal oedema can occur in these patients.

Although rare in western countries, tuberculosis of the cervical lymph nodes (*Mycobacterium tuberculosis*) is common in developing countries and is encountered in the West in immigrant populations. Tuberculous cervical lymphadenopathy results in a collar-stud abscess (Fig. 1.9). In western countries infection is more commonly caused by atypical mycobacteria, also known as MOTT (mycobacteria other than typical tubercle). These infections are nowadays most often encountered in patients suffering from AIDS.

### Lymphomas

The neck forms one of the most common sites for lymphoma, a primary tumour of lymph nodes. Lymphoma is classified into two broad categories, Hodgkin's and non-Hodgkin's lymphoma, each category being subdivided into various types depending on the cell of origin of the tumour (T or B cell) and the degree of differentiation. When it arises in the neck, the tumour forms painless



**Figure 1.9** Evolution of a collar-stud abscess. Initially, tuberculous lymph nodes are firm and discrete but as caseation (coagulative necrosis) progresses, the inflammatory process induces a marked periadenitis and the enlarged nodes become matted together. Eventually, the necrotic glands are converted into a collection of pus that burrows through the investing layer of the deep cervical fascia to form a superficial (subcutaneous) extension. This is referred to as a collar-stud abscess in view of the two localized collections superficial and deep to the investing layer of the deep cervical fascia. Although often tender, the superficial component of a collar-stud abscess is not accompanied by inflammatory changes of the overlying skin (as obtains with ordinary pyogenic abscesses). For this reason, it is often described as a cold abscess. Untreated, it 'points' and eventually erodes through the skin, forming single or multiple discharging sinuses.

non-tender swellings. The enlarged lymph nodes are discrete, firm and rubbery and may be located in either the anterior or posterior triangles. When enlarged nodes are discovered in the neck, a systematic palpation of other lymph node sites (axillary, inguinal) and palpation of the abdomen for enlarged liver and spleen are essential to determine whether the disease appears to be localized to one region or has disseminated. The patient may or may not have systemic symptoms such as malaise, intermittent fever and weight loss. The staging of lymphomas, necessary for outlining the treatment regimen, necessitates the performance of special investigations including radiology of the chest, computed tomography (CT), isotope bone scan and bone marrow biopsy. Within each stage, the absence or presence of systemic symptoms is designated by the letters A and B respectively.

### Metastatic cervical lymphadenopathy

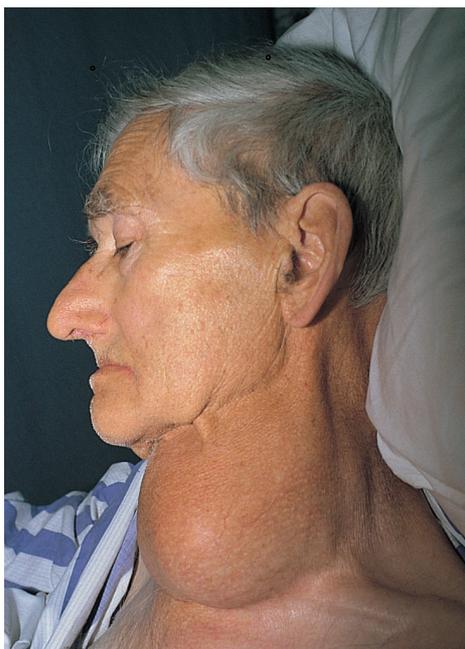
Overall, metastatic deposits in one or more cervical lymph nodes constitute the most common cause of a lump in the neck. The common sites of primary tumours that may present in this way are pharynx and larynx (squamous cell carcinomas), oral cavity (tongue, buccal mucosa), thyroid, bronchus, breast and upper digestive system (oesophagus, stomach, pancreas). The deposits may occur anywhere in the neck but the most common sites are the deep cervical and supraclavicular regions, especially on

**Table 1.9** Management of enlarged cervical lymph node suspected of metastatic tumour.

Examination of other lymph node regions
Full ear, nose and throat examination
Chest X-ray
Full blood count

the left side. Metastatic nodes are always hard in consistency and soon become fixed to surrounding tissues and matted together, although in early disease the enlarged nodes may be mobile on palpation. There is an important sequence of investigations whenever enlarged lymph nodes thought to be caused by secondary deposits are found in the neck, with no other apparent abnormality on complete physical examination. This is outlined in Table 1.9.

It is very important that this protocol is followed before the lump is submitted to biopsy, since if the primary tumour is in the head and neck (usually squamous in nature), cervical block dissection of the enlarged lymph nodes is required together with excision of the primary. The success of this treatment is jeopardized if a preliminary excision biopsy of the involved nodes has been carried out.



**Figure 1.10** Large malignant goitre in an elderly man.

### Thyroid swellings

Thyroid swellings are designated by the general term *goitre* and move on swallowing. Enlargement of the thyroid gland may be unilateral or diffuse and bilateral. If a discrete lesion is located in the isthmus of the gland, it presents as a midline swelling; otherwise the majority of unilateral swellings are lateral or anterolateral. They are commonly solid but may be cystic. Diffuse multinodular enlargement (nodular goitre) is common and associated with iodine deficiency. In some disorders such as primary hyperthyroidism the thyroid is uniformly enlarged with a smooth surface. A discrete solitary nodule in an otherwise normal thyroid should always raise suspicion of malignancy (papillary or follicular neoplasm) and must be accompanied by a systematic palpation of the neck to exclude or confirm associated lymphadenopathy (see Chapter 34). However, the anaplastic cancers encountered in older patients present as diffuse infiltrative enlargement of the thyroid gland (Fig. 1.10). Because of fixation to surrounding tissue, the mass does not move with swallowing and may be accompanied by features indicative of tracheal compression (dyspnoea and stridor) and involvement of the recurrent laryngeal nerve (hoarseness).

The position of the trachea should be checked in all patients with thyroid enlargement, and with large swellings the inferior part of the mass is palpated carefully

to determine the lower margin. If this cannot be felt, a retrosternal prolongation is likely. A large benign goitre with a retrosternal extension can give rise to pressure symptoms such as engorgement of the head and neck veins and stridor. These are accentuated when the patient elevates both upper arms above the head. Clinical assessment of thyroid status (euthyroid, hyperthyroid or hypothyroid) is an integral part of the examination of a patient with thyroid enlargement (see Chapter 34).

### Enlargement of the salivary glands

There are four major salivary glands: two parotid and two submandibular. The parotid gland has been likened to 'a lump of bread dough poured over an egg whisk', the dough representing the glandular tissue and the egg whisk the branches of the facial nerve. The gland occupies and extends over the hollow between the masseter muscle anteriorly and the sternomastoid posteriorly (see Fig. 35.3a). It is covered with a dense parotid fascia, deep to which are attached the parotid lymph nodes.

The submandibular gland overlies the mylohyoid muscle under the ramus of the mandible. The posterior part of the gland bends around the posterior border of the mylohyoid and then gives rise to the submandibular duct, which runs on the floor of the mouth to open at the frenulum of the tongue. The lingual nerve, the submaxillary ganglion and the hypoglossal nerve are situated close to the deeper part of the gland (see Fig. 35.1a).

In practice, enlargement most commonly affects the parotid gland, followed by the submandibular gland. Although swellings of the salivary glands may be due to viral infections (e.g. mumps parotitis), in surgical practice the enlargement is most commonly caused by calculous disease blocking the ductal drainage system (submandibular more commonly than parotid) or by tumours (predominantly mixed parotid tumours). Enlargements of the submandibular gland appear as swellings in the submandibular triangle. In contrast, parotid swellings occur within a large inverted triangular area with boundaries extending from the tragus of the ear to the anterior border of the mandibular ramus and the gap between the mastoid process and the angle of the mandible inferiorly. Swellings caused by infection and stones obstructing the salivary duct are painful and tender, whereas tumours are painless and non-tender (see Chapter 35).

### Face, oral cavity and scalp

Inspection forms an important part of the examination. The facial expression describes the mood of the patient and, with practice, the physician can rapidly establish anxiety, depression, introversion and mania. Inspection

of the skin and mucosal surfaces, conjunctivae and buccal mucosae identifies pallor (anaemia), central cyanosis (deoxygenation of the blood and polycythaemia) and abnormal pigmentation. The yellowish discoloration in jaundiced patients is obvious on inspection but minor grades of icterus are identified by examination of the sclera in a good light. Other features of hepatic disease include muscle wasting, bruising, spider naevi found in the territory of the superior vena cava, and yellowish-white periocular fatty deposits (xanthelasma) encountered in certain hyperlipidaemic states.

The mucosal lining of the lips and buccal mucosa may exhibit areas of pigmentation in certain disorders. The most common ulcers of the lips are viral lesions (herpes simplex), which often accompany debility and infections of the upper respiratory tract and occur as painful lesions at the angle of the mouth. Malignant ulcers of the lip are squamous cell lesions that present as painless persistent ulcers, usually on the lower lip (Fig. 1.11a). Spread is to the submental and submandibular lymph node groups in the first instance. Basal cell carcinomas (rodent ulcers) are much more frequent and occur in elderly patients, predominantly in the upper third of the face and scalp above the maxillary line (Fig. 1.11b,c). The other common malignant tumour encountered in the face and scalp is malignant melanoma (Fig. 1.12), of which there are various types. Malignant melanomas occur as pigmented lesions over a wide age range and are prevalent in fair-skinned individuals exposed to sunshine (see Chapter 36).

The buccal cavity is examined for gingival hypertrophy (often drug induced), inflammation (gingivitis) and tumours of the gums, and for lesions (ulcers, thickenings and fissures) of the tongue and buccal mucosa. Oral and mucocutaneous candidiasis (infestation by *Candida albicans*) is encountered in debilitated individuals and may complicate antibiotic therapy. The infection causes a very sore mouth and throat and may extend to the oesophagus. The affected mucosa is red and covered with white adherent patches. The pharynx can be inspected directly or indirectly with a laryngeal mirror and light source. Ulcers of the tongue should always be viewed with suspicion. While some are traumatic (caused by a jagged tooth or ill-fitting dentures) or aphthous in nature, a significant percentage prove to be malignant. As approximately one-third of cancers of the tongue occur on the undersurface or on the lateral edge of the posterior third of the tongue, examination should include elevation of the organ for inspection of the inferior surface and protrusion forwards and laterally (to either side), while the appropriate angle of the mouth is retracted to enable adequate inspection or the posterior part of the lateral borders.



**Figure 1.11** (a) Squamous carcinoma on the lower lip of an inveterate pipe smoker. (b) Early basal cell carcinoma on the forehead. At this stage treatment is straightforward and the prognosis is excellent. (c) A neglected basal cell carcinoma on the side of the head involving the ear and a large area of the scalp. Treatment is now extremely difficult and it may not be possible to remove the lesion completely.

The most common swelling of the scalp is a sebaceous cyst, which is a retention cyst of a hair follicle. Sebaceous cysts are often multiple (Fig. 1.13). They are round in shape and always attached to the skin. Their contents are



**Figure 1.12** Malignant melanoma on the leg of a 'sun worshipper'.



**Figure 1.13** Sebaceous cysts are often multiple.

cheesy in nature and on palpation they are firm and non-fluctuant. Sometimes, a punctum can be identified in the centre of the lesion. They become painful and swollen if infected, when they discharge pus and then resolve, although recurrence of the swelling is frequent.

### Examination of the breasts

The common breast complaints in females are discovery of a lump (benign or malignant), pain (mastalgia) and nipple discharge. In males, the most common ailment is unilateral or bilateral hypertrophy (gynaecomastia), which may be idiopathic (postpubertal), drug induced or secondary to certain disorders, e.g. liver disease.

Undoubtedly the most important presentation is a *palpable lump*, in view of the frequency of breast carcinoma, which now affects 1 in 12 females in western countries. *Breast pain* is a very common complaint and may be either

diffuse and cyclical, with pain and tenderness before and during menstrual periods (cyclical pronounced mastalgia), or localized to a specific area with or without a palpable lesion at this site (trigger-point mastalgia). *Nipple discharge* may occur alone or in association with other symptoms (e.g. lump or pain). The nature and colour of the discharge vary but when blood-stained, nipple discharge signifies the presence of a duct papilloma or carcinoma. The examination of the breasts should always include palpation of the neck and both axillae for lymph node enlargement.

### Inspection

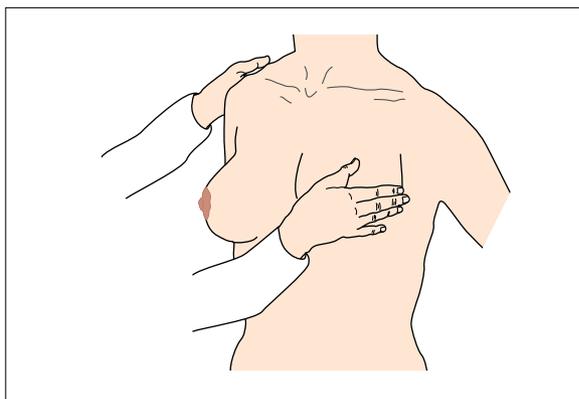
This necessitates removal of clothing to the waist and therefore requires privacy and the presence of a nurse. Inspection is carried out in two postures.

**1** The breasts are initially inspected with the patient sitting up straight and the arms by the side facing the doctor. At this stage one is assessing size, contour of breast mounds, surface abnormalities and the state and direction of the nipples. A certain amount of disparity in breast size is quite common and normal, but the nipples should point in the same direction. Inversion of the nipples is frequently encountered and may be normal or due to benign disease (usually bilateral retraction) or an underlying cancer (unilateral retraction). The skin over a breast abscess is red, shiny and oedematous. However, a similar appearance is encountered in patients with inflammatory breast cancer (mastitis carcinosa). The thickening of the skin in these patients is due to oedema secondary to cutaneous lymphatic permeation, the pitted appearance simulating orange skin — hence the term *peau d'orange*.

**2** The patient is then asked to lift her upper arms above her head. This manoeuvre normally results in uplifting of the breasts with diminished protrusion of the nipples, although the surface contour of the breast mounds should remain smooth and convex. Dimpling or localized depression or obvious inversion of the nipple is indicative of an underlying malignant mass that is causing tethering of the superficial tissues.

### Palpation of the breast

The unaffected breast is palpated first. The patient must be comfortable in the sitting or semirecumbent position, with her elbows resting on the couch and the arms on her flanks. Palpation of the breast is carried out with the flat of the hand gently compressing the breast tissue against the chest wall (Fig. 1.14). It starts in the areolar region and covers, in a systematic manner, the entire breast, including the axillary tail. If a lump is found, its position is noted but the general palpation is continued



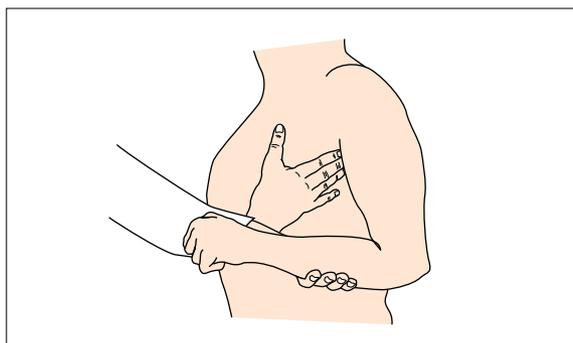
**Figure 1.14** Palpation of the breast is carried out with the flat of the hand gently compressing the breast tissue against the chest wall.

to determine whether any other lumps are present. Normal breast tissue feels soft and smooth. However, in many adult females, the breasts have a nodular lumpy consistency and the distinction between normal and abnormal may be difficult and requires considerable experience. Pathological diffuse thickening may be localized or generalized.

### Palpation of an identified breast lump

If a lump is identified during the general palpation, the following information is essential: tenderness, position, size, consistency, margins, mobility and involvement of adjacent structures and tissues. A breast abscess is exquisitely tender. Tenderness is also encountered in mammary duct ectasia, Mondor's disease (thrombophlebitis of the subcutaneous breast veins) and traumatic fat necrosis of the breast.

In terms of precise location of a lump, the breast is divided into the areolar region and four quadrants: upper inner, upper outer, lower outer, lower inner (see Fig. 14.1). The size of the lump is best measured by callipers in two directions. Size is one of the variables used in the staging of cancer of the breast. Breast cancer feels firm to hard, is not tender and has indistinct margins. In contrast, benign lesions (fibroadenomas, breast cysts) are firm, smooth and always mobile. Fibroadenoma is very mobile and tends to slip away from the examining finger and for this reason has been described as a 'breast mouse'. The mobility of a lump is tested in relation to both the overlying skin and the underlying pectoralis major fascia and muscle. Tethering or fixation of the lump to the underlying pectoral muscles is determined after the patient is asked to contract the ipsilateral pec-



**Figure 1.15** Palpation of the axilla is carried out from in front of the patient who is either in the semirecumbent or sitting position. The patient's upper arm is supported on the examiner's arm during the palpation.

toralis major muscle by pressing on her hips with her hand. Involvement of the superficial breast tissue varies from tethering, such that the skin and subadjacent breast parenchyma cannot be rolled over the mass, to actual involvement with puckering of the skin, ulceration and fungation.

### Palpation of the axillae and neck

Examination of the breasts is incomplete without careful palpation of both axillae and neck for palpable lymph nodes, which could represent metastatic disease. Palpation of the axilla is carried out from in front of the patient, who is either in the semirecumbent or sitting position. The patient's upper arm is supported on the examiner's arm during the palpation (Fig. 1.15), which must be carried out in an orderly fashion, starting at the apex of the axillae followed by the medial (chest) wall, anterior wall (pectoral muscles) and posterior wall (over the subscapularis muscle). If palpable lymph nodes are present, their number and mobility or otherwise are noted (see Chapter 43).

### Examination of the abdomen

An abdominal examination consists of several parts: examination of the abdomen, examination of the inguinal region, examination of the scrotum and testes, and rectal examination.

#### Abdominal examination

Good examination of the abdomen entails certain requirements, such as a well-lit room to detect skin colour changes and a warm environment to prevent shivering,

which results in contractions of the abdominal wall and thereby interferes with palpation of the abdomen. If the patient is in a multibed unit, curtains are drawn around the bed for privacy during the examination.

The patient is examined supine with one pillow beneath the head and a sheet or blanket covering the pubic region and the lower limbs. Patients with an acute abdomen are often more comfortable with the legs drawn up as this relieves tension on the anterior abdominal musculature. No attempt must be made to straighten their lower limbs as this will exacerbate the pain and limit the scope of the examination. Right-handed individuals should examine patients from the right side of the bed and left-handed individuals from the other side. Ideally, the patient's abdomen should be at the level of the examiner's elbow. This is achieved either by elevating the bed to the right level or by the examiner bending.

### Surface anatomy

The various quadrants described in anatomical textbooks are not practical because of considerable overlap. A better subdivision for clinical purposes is shown in Fig. 13.1, which has the following components: four quadrants (right and left upper quadrants and right and left iliac fossae), epigastric, periumbilical (or central), suprapubic and two flank (or loin) regions.

The important cutaneous landmarks on the anterior aspect are the costal margins, xiphoid process, umbilicus, anterior iliac spine, pubic tubercle, symphysis pubis and the inguinal ligament (Fig. 1.16). The useful cutaneous landmarks on the posterior aspect are the tip of the 11th rib (the 12th rib is not usually palpable), the ridge of the paraspinous muscles (erector spinae), the vertebral spinous processes and the iliac crest.

### Inspection

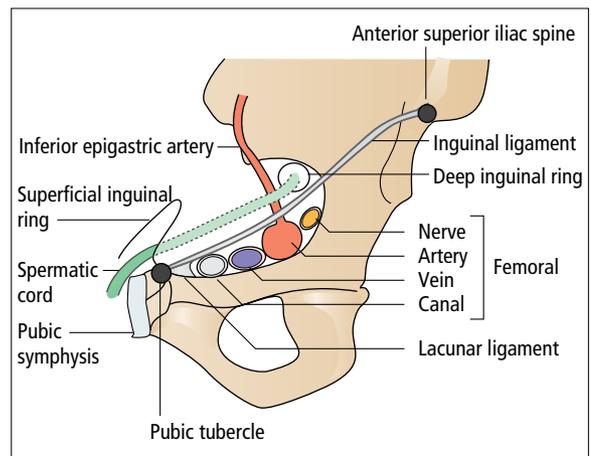
Inspection should cover the following:

- abdominal wall movement;
- contour of the abdomen;
- surface markings and abnormalities;
- hernial defects.

#### MOVEMENT AND CONTOUR

In normal individuals, the anterior abdominal wall moves passively with respiration (expands with inspiration and recedes with expiration). This movement is abolished or considerably reduced in patients with an acute abdomen, where the abdominal muscular walls are in spasm.

The contour of the anterolateral abdominal wall and the flank provides useful information in both the elective and emergency situations. In normal individuals in the supine position, the abdomen is flat, although it may be scaphoid in thin people; the contour of the flank is flat in



**Figure 1.16** Anatomy of the inguinal canal. The *midpoint* of the inguinal ligament between the anterior superior iliac spine and the pubic tubercle marks the site of the internal or deep inguinal ring, whereas the *midinguinal point* between the anterior superior iliac spine and the pubic symphysis locates the superficial femoral artery as it emerges below the inguinal ligament. The important structures below the inguinal ligament, from the lateral to medial aspect, are the femoral nerve, femoral artery, femoral vein and the femoral ring, which is bordered medially by the lacunar ligament and laterally by the femoral vein.

males and concave in females. Bulging of the flanks and abdominal distension are encountered in obesity, ascites, pregnancy and intestinal obstruction.

#### SURFACE MARKINGS AND ABNORMALITIES

These include the following:

- previous operation scars (normal, keloid, pitted due to previous infection);
- skin lesions;
- scratch marks (in jaundice);
- striae (previous pregnancy or obesity);
- bruising or staining of the skin of the abdomen, e.g. flank in acute pancreatitis (Turner's sign), periumbilical staining due to haemoperitoneum (Cullen's sign);
- obvious swellings;
- dilated abdominal wall veins (obstruction or compression of the inferior vena cava);
- previously constructed ostomies (colostomy, ileostomy);
- abnormal pulsations (abdominal aortic aneurysm).

#### HERNIAL DEFECTS

Herniation may occur through natural orifices such as the inguinal or femoral canal (see Chapter 24) or through weaknesses in the anterior abdominal wall such as beside

the umbilical cicatrix (paraumbilical hernia) or through a poorly healed surgical wound (incisional hernia). During inspection with the patient in the supine position, an unobstructed hernia appears as a momentary bulge when the intra-abdominal pressure is raised by asking the patient to cough or tense the abdominal muscles. In some patients atrophy of the recti abdominis muscles together with their separation from each other results in a central abdominal bulging defect. This is most commonly seen in multiparous females but is also encountered in males and is referred to as divarication of the recti or ventral hernia. An irreducible hernia (one that is stuck in the parietes) or an obstructed hernia appears as a constant bulge that cannot be reduced by either the patient or the doctor.

The demonstration of an incisional or ventral hernia is best achieved simply by asking the patient to lift his or her head (without support from the upper arms) from the pillow. This raises the abdominal pressure and produces a distinctive bulge. The same effect can be achieved by asking the patient to lift the lower limbs off the bed (see Fig. 24.9).

### Palpation

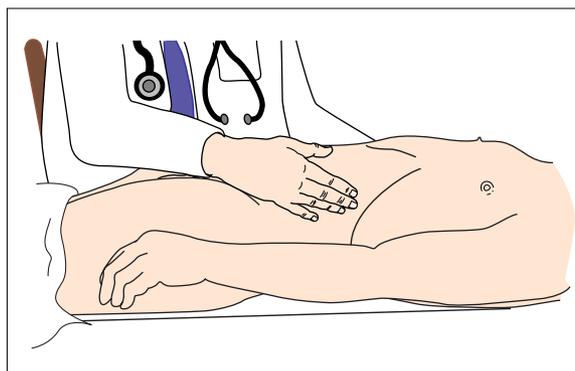
Palpation is the most important aspect of the physical examination of the abdomen. Various techniques are used: light palpation, deep palpation, palpation of specific organs (liver and spleen), bimanual palpation (kidneys and retroperitoneum) and palpation of a fluid thrill.

#### GENERAL PRINCIPLES

Aside from ensuring that the patient is in a comfortable supine position, palpation must be carried out gently with warm hands and in a systematic fashion from quadrant to quadrant. Long fingernails, by digging into the patient's skin, impair the ability to conduct the examination. A common mistake made by the inexperienced is to hurry the palpation (flitting palpation). The hand should not be transferred to another region until the doctor has registered whether the area concerned feels normal or not. Light palpation (Fig. 1.17) is conducted before deep palpation. In general, the more one presses the abdominal wall, the less one feels for two reasons. First, the tactile sensation is diminished with constant sustained pressure. Second, clumsy deep palpation hurts the patient and induces spasm of the abdominal muscular walls. The technique used varies with the state of the abdomen: acute or non-acute.

#### ACUTE ABDOMEN

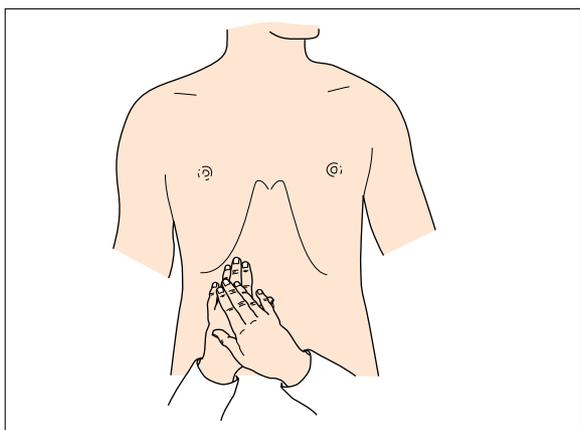
These patients are acutely ill, usually in considerable pain and some may be in shock from dehydration/hypovolaemia (see Chapter 12). The primary concern is therefore resuscitation and relief of pain by intravenous



**Figure 1.17** Light palpation of the abdomen is best performed by a doctor in the sitting or kneeling position so that the examiner's arm is comfortable and level with the anterior abdominal wall. Palpation should proceed in an orderly fashion around the quadrants of the abdomen, always starting diametrically opposite the area of interest (e.g. if the patient has right iliac fossa pain, start in the left upper quadrant). Note that the patient is exposed from the nipple line to mid-thigh.

opiates. Both these measures must precede palpation of the abdomen. Opiates should be administered via the intravenous route, especially in shocked patients, since the peripheral shutdown greatly reduces uptake of the drug by the circulation when administered via the intramuscular route. Relief of pain is not only kind and humane but also facilitates the conduct of the examination by increasing patient comfort and allaying anxiety. The belief that analgesia may mask physical signs is completely unfounded.

The abdominal palpation of patients with an acute abdomen must be conducted with the utmost gentleness and is primarily designed to establish the presence of reflex spasm of the abdominal muscles (guarding and rigidity) and the presence, extent and location of abdominal tenderness. In the presence of peritoneal irritation due to infection or escape of gastrointestinal contents (e.g. perforated peptic ulcer), both the visceral and the parietal peritoneum become inflamed (peritonitis). The localized pain and tenderness and the resulting spasm of the overlying abdominal muscles are due to stimulation of the somatic nerves supplying the abdominal parietes. When the abdominal wall is depressed by palpation, the pain is enhanced over the inflamed area. Moreover, the pain is intensified further as the pressure from the fingers is released. This is known as rebound tenderness. The test, although valuable, must be elicited with the minimum of suffering possible. In the vast majority of patients, simple coughing will induce pain in the affected region and this is equivalent to eliciting rebound tenderness by light palpation. In others, gentle percussion by the right hand on the



**Figure 1.18** Technique of deep palpation using two hands.

examiner's left fingers (placed on the abdominal wall) can elicit the sign. In any event, deep palpation must never be practised in these patients.

The extent of spasm of the abdominal musculature varies from increased tension of the abdominal wall (guarding) to board-like rigidity. To some extent, the degree of rigidity depends on the state of the individual patient's musculature. Thus, elderly patients with atrophic muscles may not exhibit significant rigidity despite an established generalized peritonitis, although they will always experience tenderness with rebound during the examination. In contrast, the abdomen of a previously fit athletic male patient with a perforated ulcer will be board-like in most instances. Physical signs, including guarding and rebound tenderness, may be abrogated by drugs (especially steroids), old age and immunosuppression from any cause. Thus, a high index of suspicion must be kept in these groups of patients.

#### NON-ACUTE ABDOMEN

Light palpation is used in the first instance and suffices for most patients. The technique entails using a slightly cupped hand that is warm and relaxed (almost dead weight), with the terminal phalanges gently depressing the anterior abdominal. The sensitivity and ability to feel lumps and normal organs increase with practice and experience, for which there is no substitute. Deep palpation is necessary in obese individuals and patients with well-developed abdominal musculature. The best technique entails the use of both hands: the left on the abdominal wall (the sensing hand) is overlapped and depressed by the right hand (Fig. 1.18). Again, as little force as is necessary is applied. Some clinicians perform deep palpation using one hand. Palpation of the abdomen in the non-acute situation is designed to detect the presence of tenderness,

the enlargement of organs (liver, spleen and kidneys) and the presence of any intra-abdominal masses.

#### SPECIFIC ORGANS

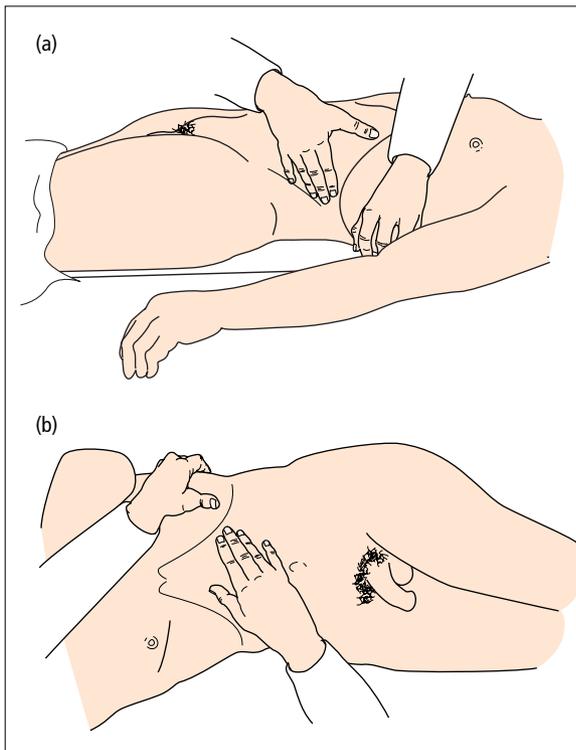
**Liver and gallbladder.** The lower edge of the liver is just palpable in most normal individuals with the tips of the fingers pointing upwards, starting in the right lower quadrant and moving up towards the right costal margin. Normally, a distinct smooth edge is felt that moves and becomes more prominent with inspiration. The substance of the liver lies underneath the thoracic cage and its upper margin is therefore impalpable; however, its position can be identified by percussion (see later). When the liver enlarges as a result of disease, the anterior superior surface becomes palpable as a firm mass extending from the right hypochondrium to the epigastric region. Normally, the gallbladder is not palpable. When enlarged, as in patients with cancer of the head of the pancreas (see Chapter 29), it is felt as a round smooth swelling that moves with respiration in the right hypochondrium along the midclavicular line.

**Spleen.** This has to be enlarged to one-and-a-half to twice its normal size (splenomegaly) before it can be felt. As the spleen enlarges medially and inferiorly, it projects for a varying distance below the left costal margin towards the right lower quadrant. Palpation of the spleen requires elevation of the left lower ribcage and flank as the abdomen is palpated with the right hand starting in the right iliac fossa (Fig. 1.19a). When uncertainty remains as to whether a spleen is palpable or not, the patient should be positioned in the right semiprone position as this results in anterior displacement of the organ (Fig. 1.19b). Palpation of the spleen should be carried out during inspiration because the diaphragm pushes the organ downwards, rendering it more accessible to the tips of the fingers. In some enlarged spleens a distinct notch is palpable along the anterior margin, but this is by no means universal.

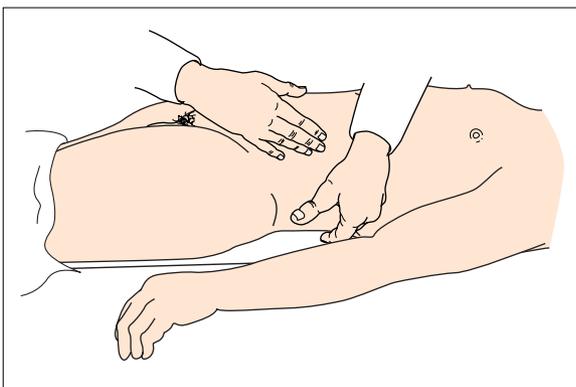
**Kidneys.** The kidneys are examined by the technique of bimanual palpation shown in Fig. 1.20. For the right kidney, the left hand is placed beneath the right flank and the right hand is placed anteriorly. The left hand is used to lift the retroperitoneal contents and thereby trap the mass or kidney between the two hands. The kidneys are not palpable in health, although in thin patients the lower poles may be felt occasionally. On the right side, an enlarged kidney has to be differentiated from a mass in the hepatic flexure or enlarged liver. On the left, the differentiation is between an enlarged spleen and mass in the descending colon.

#### INTRA-ABDOMINAL MASSES

Distinction between intra-abdominal masses and swellings within the abdominal wall is achieved by asking the



**Figure 1.19** (a) Palpation of the spleen requires elevation of the left lower ribcage and flank as the abdomen is palpated with the right hand starting in the right iliac fossa. (b) When uncertainty remains as to whether a spleen is palpable, the patient should be positioned in the right semiprone position, as this results in anterior displacement of the organ.



**Figure 1.20** The kidneys are examined by the technique of bimanual palpation. The technique for examining the left kidney is shown here.

**Table 1.10** Palpable abdominal masses.

<i>Mass in RUQ:</i>	cancer of the hepatic flexure, enlarged gallbladder, enlarged right kidney
<i>Mass in RUQ extending to the epigastrium:</i>	hepatomegaly
<i>Mass in the epigastric region:</i>	liver, gastric cancer, abdominal aortic aneurysm
<i>Mass in LUQ:</i>	splenomegaly, cancer of the descending colon, swelling in tail of pancreas, enlarged left kidney
<i>Mass in the periumbilical region:</i>	paraumbilical hernia, cancer of the transverse colon, tumour deposit from visceral neoplasm (Sister Mary Joseph's nodule)
<i>Mass in LLQ:</i>	constipation (faecal scybala), cancer of the descending colon
<i>Mass in the suprapubic region:</i>	distended urinary bladder, pregnancy, ovarian cyst
<i>Mass in RLQ:</i>	appendiceal disease, cancer of the ascending colon, Crohn's disease of the terminal ileum
<i>Mass in the inguinal region:</i>	hernia, enlarged lymph node (inflammatory, lymphoma, secondary tumour deposit), saphena varix, aneurysm

LLQ, left lower quadrant; LUQ, left upper quadrant; RLQ, right lower quadrant; RUQ, right upper quadrant;.

patient to contract the abdominal muscles. This accentuates intramural masses and renders intra-abdominal swellings less distinct or impalpable. The most important clue to the nature of a swelling within the abdomen is the site (Table 1.10). Other important features include presence of tenderness over the mass (denotes an inflammatory component), mobility with palpation, movement with respiration and consistency.

### Percussion

Percussion is best regarded as an adjunct to palpation. It is used to determine the presence of tenderness, to estimate the size of an enlarged organ or mass, and to distinguish gaseous distension of hollow organs from an excessive amount of fluid in the peritoneal cavity (ascites), both of which cause generalized abdominal distension. The technique consists of gentle tapping with the right fingers (and a relaxed right wrist) on the index and middle finger of the left hand placed on the area to be percussed. A resonant note is obtained over a hollow organ distended with air (dilated stomach, colon, etc.) whereas a dull note is elicited over a solid organ (e.g. liver) or mass and fluid-filled cavities (e.g. distended urinary bladder, intra-abdominal cyst, ascites).

*Liver.* The objective is to determine the size of the liver. The upper margin is defined first. This is normally situated at the level of the sixth rib in the midclavicular line