SECOND EDITION

RAPID Surgery

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WILEY-BLACKWELL

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Second Edition

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Preface

In *Rapid Surgery*, we envisaged a student revision aid that focused on key facts presented in a classical mnemonic format to facilitate learning. This consisted of each subject presented in the subheadings of D: Definition; A: Aetiology; A: Associations/Risk Factors; E: Epidemiology; H: History; E: Examination; P: Pathology/Pathogenesis; I: Investigations; M: Management; C: Complications and P: Prognosis. In this second edition, the presentation has been revised with clearer subheadings to help the reader. We have updated the content and introduced new topics, for example, bariatric surgery, that have an important place in modern surgical practice.

We hope that this book will continue to compliment your personal and ward-based learning and you enjoy reading it.

We thank our previous contributors, Dr Mark Teo, Dr Ebube Obi and Professor Brian Davidson, MD, FRCS. We thank our teachers through the years, Wiley-Blackwell publishing for their support and the patients who were our chief educators.

Finally, we would like to acknowledge our families for their support, especially the Bakers and Ping Lim.

Cara R. Baker
George Reese
James T.H. Teo

List of abbreviations

AAA	abdominal aortic aneurysm
ABC	airway, breathing, circulation
ABG	arterial blood gas
ABPI	ankle–brachial pressure index
ACAG	acute closed-angle glaucoma
ACE	angiotensin-converting enzyme
ACTH	adrenocorticotropic hormone
AKA	above-knee amputation
AMI	acute myocardial infarction
ANDI	aberrations of normal development and involution
AP	anterioposterior
ARDS	acute respiratory distress syndrome
ASA	American Society of Anesthesiologists
5-ASA	5-aminosalicylic acid
ATLS	advanced trauma life support
AV	arteriovenous
AVM	arteriovenous malformation
AXR	abdominal X-ray
BCG	bacillus Calmette–Guérin
BP	blood pressure
BPH	benign prostatic hyperplasia
CABG	coronary artery bypass grafting
CAVATAS	Carotid and Vertebral Artery Transluminal Angioplasty Study
CEA	carcinoembryonic antigen
CMV	cytomegalovirus
CRP	C-reactive protein
CSDH	chronic subdural haematoma
CT	computed tomography
CVA	cerebrovascular accident
CVP	central venous pressure
CXR	chest X-ray
DM	diabetes mellitus
DMSA	dimercaptosuccinic acid
DNA	deoxyribonucleic acid
DTPA	diethylenetriamine pentaacetic acid
DVT	deep vein thrombosis
EBV	Epstein–Barr virus
ECG	electrocardiogram
ECST	European Carotid Surgery Trial
EEG	electroencephalogram/graphy
ERCP	endoscopic retrograde cholangiopancreatography
EVAR	endovascular aortic aneurysm repair
FAP	familial adenomatous polyposis
FBC	full blood count
FEV	forced expiratory volume
FFP	fresh frozen plasma
FNA	fine-needle aspiration
FNAC	fine-needle aspiration cytology
G&S	group and save
GCS	Glasgow Coma Scale

GI	gastrointestinal
GIST	gastrointestinal stromal tumour
GORD	gastro-oesophageal reflux disease
HCC	hepatocellular carcinoma
HCG	human chorionic gonadotropin
HDU	high dependency unit
HIV	human immunodeficiency virus
HNPCC	hereditary nonpolyposis colorectal cancer
HPFs	high power fields
HRT	hormone replacement therapy
IBD	inflammatory bowel disease
IC	inspiratory capacity
ICP	intracranial pressure
IgG	immunoglobulin G
INR	international normalized ratio
IOP	intraocular pressure
IPSS	International Prostate Symptom Score
ITU	intensive therapy unit
IV	intravenous
IVC	inferior vena cava
IVU	intravenous urogram
JVP	jugular venous pressure
KUB	kidney, ureter, bladder
LBO	large-bowel obstruction
LDH	lactate dehydrogenase
LFT	liver function test
LHRH	luteinising hormone–releasing hormone
LIF	left iliac fossa
LMN	lower motor neuron
LUTS	lower urinary tract symptom
MALT	mucosa-associated lymphoid tissue
MC&S	microscopy culture and sensitivity
MEN	multiple endocrine neoplasia
MI	myocardial infarction
MRA	magnetic resonance angiography
MRI	magnetic resonance imaging
MRCP	magnetic resonance cholangiopancreatography
MSU	midstream urine
MTP	metatarsophalangeal
M-VAC	methotrexate, vinblastine, doxorubicin and cisplatin
NASCET	North American Symptomatic Carotid Endarterectomy Trial
NCAM	neural cell adhesion molecule
NG	nasogastric
NPI	Nottingham Prognostic Index
OCP	oral contraceptive pill
OGD	oesophagogastroduodenoscopy
pANCA	p antineutrophil cytoplasmic autoantibody
PBC	primary biliary cirrhosis
PE	pulmonary embolism
PET	positron emission tomography
POAG	primary open-angle glaucoma
PPI	proton pump inhibitor
PR	per rectum
PSA	prostate-specific antigen

PSC	primary sclerosing cholangitis
PTC	percutaneous transhepatic cholangiography
PTFE	polytetrafluoroethylene
PUFA	polyunsaturated fatty acid
PUVA	psoralen ultraviolet A
RAS	renal artery stenosis
RBBB	right bundle branch block
RBC	red blood cell
RCC	renal cell carcinoma
RIF	right iliac fossa
RPE	retinal pigment epithelium
SBO	small-bowel obstruction
SBP	spontaneous bacterial peritonitis
SC	subcutaneous
SDH	subdural haematoma
SFJ	saphenofemoral junction
SIADH	syndrome of inappropriate antidiuretic hormone
SLE	systemic lupus erythematosus
spp.	species (pl)
ST	sinus tachycardia
SVC	superior vena cava
TB	tuberculosis
TED	thrombo-embolic deterrent
TIA	transient ischaemic attack
TNM	tumour, node, metastasis
tPA	tissue-plasminogen activator
TRUS	transrectal ultrasonography
TURBT	trans-urethral resection of bladder tumour
TURP	trans-urethral resection of prostate
U&E	urea and electrolytes
UICC	International Union Against Cancer
UMN	upper motor neuron
URTI	upper respiratory tract infection
USG	ultrasonography
USS	ultrasound scan
UTI	urinary tract infection
UV	ultraviolet
WCC	white cell count

Breast abscess

DEFINITION

Localised infection with pus collection in breast tissue. The two main forms are puerperal (lactational) and non-puerperal.

AETIOLOGY

Lactational: Milk stasis associated with infection, most commonly with *Staphylococcus aureus*, coagulase-negative staphylococci.

Non-puerperal: *S. aureus* and anaerobes, often enterococci or *Bacteroides* spp. (TB and actinomycosis are rare causes). Smoking, mammary duct ectasia/periductal mastitis, associated inflammatory breast cancer should be excluded. Also associated with wound infections after breast surgery, diabetes and steroid therapy.

EPIDEMIOLOGY

Lactational breast abscesses are common and tend to occur soon after starting breast-feeding and on weaning, when incomplete emptying of the breast results in stasis and engorgement. Non-lactational abscesses are more common in those aged 30–60 years and in smokers.

HISTORY

The patient complains of discomfort and development of a painful swelling in an area of the breast. She may complain of feeling unwell and feverish.

Women with a non-puerperal abscess often have a history of previous infections, systemic upset is often less pronounced.

EXAMINATION

Local: The area of the breast is swollen, warm and tender. The overlying skin may be inflamed; examination of the nipple may reveal cracks or fissures. In non-puerperal cases, there may be evidence of scars or tissue distortion from previous episodes, or signs of duct ectasia, e.g. nipple retraction.

Systemic: Pyrexia, tachycardia.

INVESTIGATIONS

Imaging: Ultrasound + aspiration for microscopy, culture and sensitivity of pus samples.

MANAGEMENT

Medical: Early, cellulitic phase may be treated with antibiotics (flucloxacillin in the case of lactational, with the addition of metronidazole in non-puerperal abscesses). Regular breast drainage to prevent milk stasis.

Surgical: *Lactational*: Daily needle aspiration with antibiotic cover may be successful. Formal incision and drainage is reserved for larger abscesses (>5 cm). The incision should allow full drainage and be cosmetically acceptable; loculi are explored and broken down. The wound may be packed lightly and left open, with daily packing, or primary closure performed. Breastfeeding should continue from the non-affected breast and the affected side emptied either manually or with a breast pump. Advice on avoiding cracked nipples.

Non-puerperal: Open drainage should be avoided, or carried out through a small incision. Definitive treatment should be carried out once the infection has settled by the excision of the involved duct system.

COMPLICATIONS

Slow wound healing, difficulties in breastfeeding, poor cosmetic outcome and mammary fistula formation; rarely, overlying skin undergoes necrosis.

PROGNOSIS

If untreated, a breast abscess will eventually point and spontaneously discharge onto the skin surface. Non-puerperal abscesses tend to recur.

Breast cancer

DEFINITION

Malignancy arising from breast tissue.

AETIOLOGY

Combination of genetic and environmental factors.

Genetics: Most cases are polygenic risk with 5–10% attributable to inherited factors. BRCA-1 (17q) and BRCA-2 (13q) gene mutations are implicated in ~2% of cases (carriers have lifetime risk up to 87%). Rare genetic breast cancer syndromes include Li–Fraumeni syndrome (TP53), Cowden's syndrome (PTEN), Peutz–Jeghers syndrome (STK11/LKB1), ataxia-telagiectasia (ATM) and Muir–Torre syndrome (MSH2/MLH1).

ASSOCIATIONS/RISK FACTORS

Age, prolonged exposure to female sex hormones (particularly oestrogen), nulliparity, early menarche, late menopause, menopausal hormone replacement therapy, obesity, alcohol.

EPIDEMIOLOGY

Worldwide, the leading cause of cancer death in women (second only to lung cancer in the USA). The lifetime risk is 1 : 9 in the UK. Peak incidence in 40- to 70-year-olds. Rare in men (<1% of all breast cancers).

HISTORY

May be detected from screening.

Symptoms of primary: Breast lump (usually painless), changes in breast shape, nipple discharge.

Symptoms of secondary spread: Axillary lump, bone pain, weight loss, paraneoplastic syndromes (e.g. cerebellar syndrome).

EXAMINATION

Inspection of breasts with the patient upright and supine, assessing for asymmetry, peau d'orange appearance of skin (oedema), dimpling or tethering, nipple scaling or inversion or, in advanced cases, ulceration.

Palpation using clockwise radial technique (for hard, irregular, fixed lumps).

Examination for palpable axillary, supraclavicular lymph nodes, chest abnormalities, hepatomegaly, bony tenderness.

INVESTIGATIONS

Triple assessment: Standardised approach to investigating a breast lump, consisting of clinical examination, imaging (mammography, ultrasound, MRI) and tissue diagnosis (cytology or biopsy).

Mammogram (Fig. 1): Useful screening investigation in women >35 years. In the UK, screening begins after the age of 50. Standard views are craniocaudal and mediolateral oblique. Features of malignancy include branching or linear microcalcifications and spiculated lesions.

Ultrasound: To identify benign cystic lesions from sinister solid lesions. More useful in women <35 years.

Fine-needle aspiration: Minimally invasive, allows cytology of discrete breast lumps and drainage of cysts.

Core biopsy: Can be image guided, enables histological diagnosis.

Sentinal lymph node biopsy: Radioactive tracer and/or blue dye is injected near the breast lesion, and a nuclear scan identifies the sentinel node and the node is biopsied to detect spread.

Staging: CT (chest, abdomen, pelvis), PET or bone scanning for metastases.

Blood: FBC, U&Es, Ca^{2+}, bone profile, LFT, tumour marker (CA-15-3).

Breast cancer (continued)

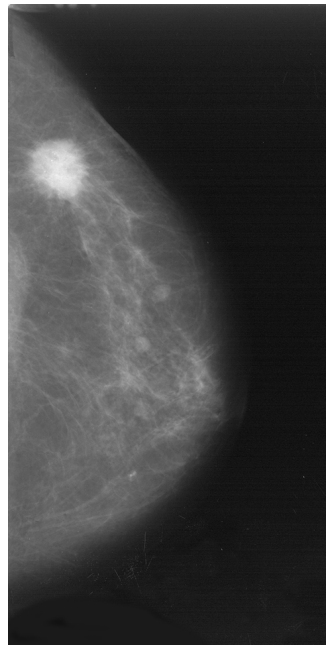

Figure 1 Mammogram showing a spiculated breast cancer lesion.

Histology:

- *In situ carcinoma*: Non-invasive with basement membrane intact – ductal or lobular carcinoma in situ (DCIS, LCIS).
- *Invasive*: Most common is ductal carcinoma (75% of breast cancers).
- *Others*: Lobular (10–15%, 'Indian filing' arrangement of cells), tubular, mucinous, medullary, cribriform, papillary and Paget's disease of the nipple (ductal carcinoma *in situ* infiltrating the nipple).
- *Phlloides*: Fibroepithelial tumours that can be benign or malignant.
- *Molecular prognostic factors*: Oestrogen and progesterone receptors (ER, PR) and HER-2 expression (20–30% of cancers) are valuable prognostic indicators and guide treatment. Flow cytometry measures DNA content (ploidy) and S-phase fraction (cell proliferation rate).

Grading: The Nottingham modification of the Bloom and Richardson grading system is a prognostic indicator. Three features assessed are tubule formation, nuclear size/pleomorphism and number of mitoses. Scores are used to generate Grades 1 (well differentiated) to 3 (poorly differentiated).

Staging: The UICC TNM-staging system.

Tumour size (T): T1: <2 cm; T2: 2–5 cm; T3: >5 cm; T4: any size with chest wall or skin extension.

Nodes (N): N1: mobile ipsilateral axillary; N2: fixed ipsilateral axillary; N3: ipsilateral internal mammary nodes.

Metastases (M): M0: no distant metastases; M1: distant metastases.

Breast cancer (continued)

MANAGEMENT

Multidisciplinary management: Includes breast surgeon, radiologist, oncologist and breast care nurses. Surgery to remove the cancer depends on the size, location, type, stage and consideration of the individual patient's wishes.

Breast-conserving surgery: Wide local excision/segmental mastectomy (single cancer, <5 cm, can be excised as a whole and patient is willing to undergo radiotherapy). Smaller lesions may need radiological wire localisation.

Modified radical mastectomy: Total mastectomy, axillary lymph node dissection.

Axillary surgery: Is necessary for node staging and ranges from sentinel node biopsy (on average three nodes removed) to level III clearance (lymph nodes up to and above pectoralis minor muscle).

Breast reconstruction: Often as a delayed procedure, occasionally concurrently with surgical excision. Breast prostheses, latissimus dorsi or transverse rectus abdominis myocutaneous flaps are methods used.

Radiotherapy: External beam radiotherapy following breast-conserving surgery, occasionally as neoadjuvent therapy and in palliation of advanced tumours.

Chemotherapy: Treatment can be in neoadjuvent, adjuvant and palliative settings. More often in premenopausal women, rapidly progressive disease, visceral involvement, oestrogen receptor-negative tumours or where hormonal treatment has failed. Combination regimens, e.g. cyclophosphamide, methotrexate and 5-fluorouracil (CMF), are tailored to the individual patient.

Hormonal therapy: Includes selective oestrogen receptor modulators, e.g. tamoxifen, the main first-line therapy for oestrogen receptor-positive tumours. Others include aromatase inhibitors in postmenopausal women, e.g. anastrozole or letrozole; ovarian ablation with LHRH-analogues, e.g. goserelin; and selective oestrogen receptor downregulators, e.g. fulvestrant and progestins.

Biological therapy: Trastuzumab (Herceptin) is a monoclonal antibody against HER-2 receptor (cell growth promoter) used in combination with chemotherapy in node and HER-2-positive cancer, and is shown to improve disease-free and overall survival.

COMPLICATIONS

Significant psychological morbidity from diagnosis or physical deformity from surgery. Metastases can cause bone pain, hypercalcaemia, cord compression and cerebral, abdominal or pulmonary complications.

From tamoxifen: Endometrial cancer, venous thrombosis. Aromatase inhibitors: joint/muscle ache, osteoporosis. Herceptin: cardiotoxicity.

From surgery: Wound infection, haematoma, lymphoedema, shoulder pain, sensory loss (the intercostobrachial nerve is commonly sacrificed, resulting in an area of numbness on the inner, upper arm), local recurrence.

From radiotherapy: Fatigue, skin changes, lymphoedema.

PROGNOSIS

Depends on type, grade and stage. Overall 5-year survival 100% if localised to breast, 50–90% for node-positive disease and 20% with distant metastases.

Breast disease, benign

DEFINITION

Non-malignant conditions of the breast, including physiopathological lesions of epithelial, stromal, fat or vascular components of the breast.

Fibroadenoma: Result from hyperplasia of a breast lobule and contain both normal epithelial and connective tissue elements.

Fat necrosis: Irregular and necrotic adipocytes, amorphous material and inflammatory cells, including foreign body giant cells, can mimic malignancy.

Sclerosing adenosis: Is an aberration of normal involution.

Duct ectasia: Occurs when central ducts become dilated with duct secretions; if leakage occurs into periductal tissue, this causes an inflammatory reaction (periductal mastitis).

AETIOLOGY

Breast tissue undergoes a wide range of changes under endocrine control. Fat necrosis occurs secondary to trauma. The ANDI (aberrations of normal development and involution) classification maps benign conditions according to both the pathogenesis and the degree of abnormality. Please see **Associations/Risk Factors**.

ASSOCIATIONS/RISK FACTORS

May be less common in those on contraceptive pill. Smoking is a risk factor for periductal mastitis.

EPIDEMIOLOGY

Commonly estimated only 10–20% of cases come to histological diagnosis. Diffuse fibrocystic changes are very common, seen in as many as 60% of women, and 70% experience mastalgia. Fibroadenomas are more common in the 15–25 age group, breast cysts in 40- to 50-year-olds, and usually disappear after menopause unless on hormone replacement therapy (HRT).

HISTORY

History of breast discomfort or pain (cyclical or non-cyclical mastalgia), swelling or lump. Nipple discharge (if bloodstained, malignancy should be suspected). Risk factors for breast cancer should be ascertained, including family history, menstrual history, pregnancies, use of OCP or hormone replacement therapy.

EXAMINATION

Focal or diffuse nodularity of breasts.

Fibroadenomas are usually smooth, well-circumscribed and mobile lumps (1–2 cm in diameter, 'breast mouse').

Yellow/green nipple discharge (duct ectasia).

Features of malignancy are absent, e.g. dimpling, peau d'orange skin changes, enlarged axillary lymph nodes.

INVESTIGATIONS

Usually performed in the context of triple assessment:

1. Clinical examination.
2. Imaging: Mammography (craniocaudal and oblique mediolateral views ± spot compression and magnification views) or USS in younger patients (<35 years). Benign masses are less likely to be calcified (microcalcifications are highly suggestive of malignancy). MRI scanning can also be useful.
3. Cytology/histology: By FNA (fine-needle aspiration) cytology or trucut or excision biopsy.

MANAGEMENT

Conservative: Symptomatic treatment, e.g. analgesia, evening primrose oil (a rich source of gammalinoleic acid) for mastalgia. Advice on wearing supportive bra and diet (reduced dietary fat). Danazol is used as second-line treatment. (17-α-ethinyl testosterone suppresses gonadotropin secretion, prevents LH surge and inhibits ovarian steroid formation). Fibroadenomas may be treated conservatively or removed if large or on request.

Breast disease, benign (continued)

Simple cysts do not need aspiration unless clinically indicated and, on aspiration, should disappear completely. If not, it should be treated as a breast lump.

Surgery: Includes removal or excision biopsy of breast lump; a wide local excision should be performed if there is any suspicion that it is not benign. Microdochectomy is performed for intraductal papillomas. Hadfield's (or Adair's) operation excises central ducts in duct ectasia.

COMPLICATIONS

Pain, recurrence.

PROGNOSIS

Good, although recurrence is common. Fibroadenomas: no increased risk of cancer in woman with simple FA and no increased family history of breast cancer.

Lung cancer

DEFINITION

Primary malignant neoplasm of the lung. WHO classification of bronchocarcinoma: small cell (20%) and non-small cell (80%) – squamous cell carcinoma, adenocarcinoma, large-cell carcinoma, adenosquamous carcinoma.

AETIOLOGY

Primary lung tumours: Factors such as smoking (active or passive) and asbestos exposure are thought to ultimately cause genetic mutations that result in neoplastic transformation. Tumours generally arise in main or lobar bronchi (see Fig. 2), and adenocarcinomas tend to occur more peripherally.

Secondary tumours: The lung is a common site for metastasis (see Fig. 3).

ASSOCIATIONS/RISK FACTORS

Smoking, occupational exposures (polycyclic hydrocarbons, asbestos, nickel, chromium, cadmium, radon), atmospheric pollution.

EPIDEMIOLOGY

Most common fatal malignancy in the West (18% of cancer mortality worldwide), 35,000 deaths per year (UK), 3× more common in men (but ↑ in women).

HISTORY

May be asymptomatic with radiographic abnormality (5%).

Due to primary: Cough, haemoptysis, chest pain, recurrent pneumonia.

Due to local invasion: For example, brachial plexus (Pancoast's tumour) causing pain in the shoulder or arm, left recurrent laryngeal nerve leading to hoarseness and bovine cough, oesophagus (dysphagia), palpitations (arrhythmias).

Due to metastatic disease or paraneoplastic phenomena: Weight loss, fatigue, bone pain or fractures, fits.

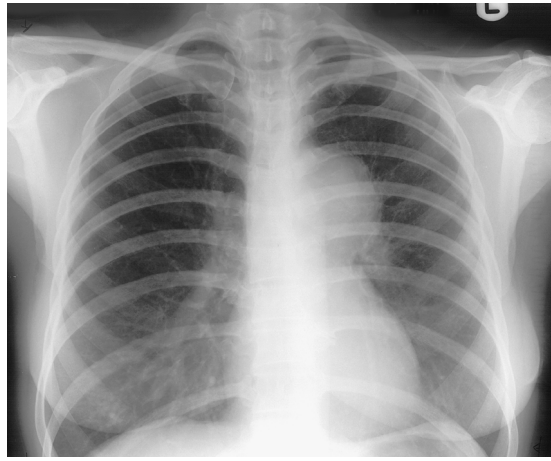

Figure 2 Chest radiograph showing primary bronchial carcinoma behind left hilum.

Lung cancer (continued)

EXAMINATION

There may be no signs.
Fixed monophonic wheeze.
Signs of lobar collapse or pleural effusion.
Signs of metastases (e.g. supraclavicular lymphadenopathy or hepatomegaly).
Horner's syndrome.

INVESTIGATIONS

Diagnosis: CXR, sputum cytology, bronchoscopy with brushings or biopsy, CT- or ultrasound-guided percutaneous biopsy, lymph node biopsy.

TNM staging: Based on tumour size, nodal involvement and metastatic spread, using CT chest, CT or MRI head and abdomen, bone scan and PET scan. Invasive methods like mediastinoscopy or video-assisted thoracoscopy may be used.

Blood: FBC, U&Es, Ca^{2+} (hypercalcaemia is common), AlkPhos (↑ bone metastases), LFT.

Pre-op: ABG, pulmonary function tests (FEV1 > 80% predicted to tolerate a pneumonectomy; lung resection is contraindicated if FEV1 < 30% predicted), V/Q scan, ECG, echocardiogram and general anaesthetic assessment.

MANAGEMENT

Multidisciplinary discussion on tumour staging and optimal treatment modality. Important considerations (surgery is not appropriate for small-cell cancer) are resectibility of the tumour (stage I and II disease, selectively IIIa) and operability (whether a patient is fit enough to undergo surgery). Frank discussion with the patient about the risks/benefits and the prognosis is vital. Only ~14% cases are considered for surgery.

Surgery

- *Anaesthesia:* A double-lumen endotracheal tube is used to isolate the lung to be operated on from the ventilatory circuit. Central line is placed ipsilateral to the lung to be operated on. Arterial line and urinary catheter are sited. Often, a thoracic epidural catheter is placed to give good regional analgesia.
- *Procedure:* Rigid bronchoscopy is performed following induction of anaesthesia in the case of bronchial tumours. Antibiotic prophylaxis is used. Thoracotomy (usually

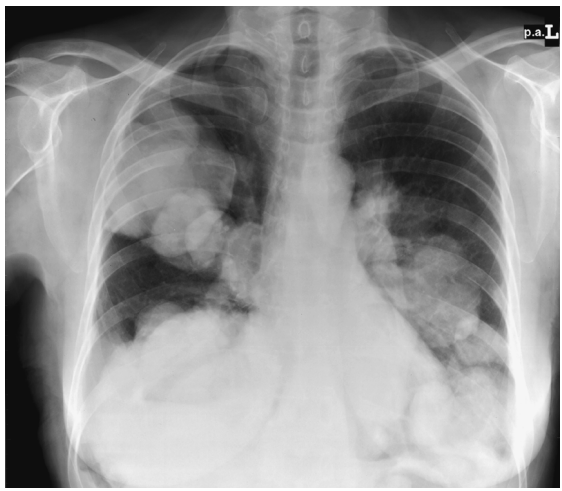

Figure 3 Chest radiograph showing cannon ball metastases (secondaries).

Lung cancer (continued)

posterolateral with the patient in a lateral decubitus position) is performed with gradual distraction of the ribs. The lung is mobilised and the position of the tumour assessed and lymph nodes inspected. Branches of the bronchial tree, pulmonary artery and vein are identified and a lobectomy performed if appropriate (~60% of resections). Bilobectomy can be performed in the right lung, with preservation of the upper or lower lobe. Sleeve resection is used to avoid pneumonectomy (involves partial resection and reconstruction of bronchi). Pneumonectomy (25% of resections) involves removal of one lung. An anterior apical drain is placed to drain air, a posterior basal drain for blood or fluid.

Non-operable: Multimodality therapy with radiotherapy and chemotherapy improves survival. Docetaxel is commonly used. Biological therapy in the form of erlotinib (inhibitor of epidermal growth factor receptor, EGFR) is a second-line chemotherapy agent.

Palliation and terminal care: Includes laser therapy to bronchial tumours, endobronchial stents, management of complications and pain control.

COMPLICATIONS

Local invasion (e.g. brachial plexus, sympathetic chain, recurrent laryngeal nerve, SVC), metastases (commonly liver, bone and brain), pleural effusion, pulmonary haemorrhage, lobar or lung collapse, paraneoplastic syndromes (particularly common in small-cell carcinomas, e.g. SIADH or ectopic ACTH production; squamous cell carcinomas are associated with hypercalcaemia of malignancy).

Surgery: Lesion unresectable at surgery (should be <5%).

Lobectomy: Air leaks are common, occasionally require re-operation.

Pneumonectomy: Considerable physiological strain due to the whole of cardiac output passing through one lung, risks of cardiac arrhythmias, failure or MI, atelectasis and pneumonia, pulmonary oedema, bronchopleural fistula, bleeding, pulmonary embolus.

PROGNOSIS

Depends on stage, but generally poor. Small-cell carcinoma is often disseminated by the time of presentation. Overall 5-year survival <5%. After resection for early stage disease, 5-year survival ~25%. Mortality of lobectomy is <2%, and mortality for pneumonectomy is 8%.

Pulmonary embolism

DEFINITION

Occlusion of pulmonary vessels, most commonly by a thrombus that has travelled to the vascular system from another site.

AETIOLOGY

Thrombus (>95% originating from DVT of the lower limbs and rarely from the right atrium in patients with atrial fibrillation). Other agents that can embolise to pulmonary vessels include amniotic fluid, air, fat, tumour and mycotic emboli from right-sided endocarditis. Groups at risk include surgical patients, and patients suffering from immobility, obesity, OCP, heart failure, malignancy.

EPIDEMIOLOGY

Relatively common, especially in hospitalised patients; occur in 10–20% of those with a confirmed proximal DVT.

HISTORY

Depends on the size and site of the pulmonary embolus.

Small: May be asymptomatic.

Moderate: Sudden onset dyspnoea, cough, haemoptysis and pleuritic chest pain.

Large (or proximal): All of the above plus severe central pleuritic chest pain, shock, collapse, acute right heart failure or sudden death.

Multiple small recurrent: Symptoms of pulmonary hypertension.

EXAMINATION

Clinical probability assessment: Various scores can predict probability to guide further investigation and management. Use local guidelines.

Well's score		Revised Geneva Score	
>4 High probability <3 Intermediate probability		>11 High probability 4–10 Intermediate probability <3 Low probability	
Clinically suspected DVT	3.0	>65 years	1
PE is most likely diagnosis	3.0	Recent surgery or fracture (1 month)	2
Recent surgery (4 weeks)	1.5	Previous DVT/PE	3
Immobilisation	1.5	Active malignancy	2
Tachycardia	1.5	Unilateral leg pain	3
History of DVT or PE	1.5	Haemoptysis	2
Haemoptysis	1.0	Heart rate >75–94/minute	3
Malignancy	1.0	Heart rate >95/minute	5
		Unilateral leg oedema and tenderness	4

Severity of pulmonary embolism can be assessed based on associated signs:

- *Small:* Often no clinical signs. Earliest sign is tachycardia or tachypnoea.
- *Moderate:* Tachypnoea, tachycardia, pleural rub, low saturation O_2 (despite oxygen supplementation).
- *Massive PE:* Shock, cyanosis, signs of right heart strain (↑ JVP, left parasternal heave, accentuated S2 heart sound).
- *Multiple recurrent PE:* Signs of pulmonary hypertension and right heart failure.