Hunt & Marshall’s
Clinical Problems in Surgery
SECOND EDITION
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Hunt and Marshall’s
Clinical Problems in Surgery
Second edition
Contents

Foreword ix
Preface x
Acknowledgements xi
Contributors xii
Reviewers xiii

Introduction
The problem-oriented clinical approach xiv
1 Collect and record the database xviii
2 Constructing a problem list xix
3 Assessment and plan xx
4 Progress notes xxi
5 Discharge summaries xxii
Student case presentations

1 Integument problems Jane Fox and David Speakman
1.1 Introduction 1
1.2 Focal skin lesions 3
1.3 Subcutaneous lumps 8
1.4 Cutaneous and subcutaneous infections 13
1.5 Lymph node swellings 17

2 Ear, nose and throat and head and neck problems Sarin Wongprasartsuk, Andrew Danks and Neil Vallance
2.1 Introduction 31
2.2 Ear 35

3 Breast problems Jane Fox
3.1 Introduction 67
3.2 Breast pain 69
3.3 Breast lump 71

2.3 Facial weakness 42
2.4 Nose and sinuses 42
2.5 Throat 45
2.9 Dysphagia 51
2.10 Congenital anomalies 51
2.12 Head and neck cancer 53
2.13 Larynx 53
2.14 Parotid and salivary glands 53
2.15 Thyroid/parathyroid 55
2.16 Mouth ulcers and lesions 61
2.17 Approach to a head and neck lump 63
2.18 Neck pain 63
2.19 Cranial nerve evaluation 64

3.1 Introduction 67
3.2 Breast pain 69
3.3 Breast lump 71
3.4 Nipple discharge 74
3.5 Gynaecomastia 76

4 Chest and chest wall problems 78
Julian Smith
4.1 Introduction 78
4.2 Acute chest pain 83
4.3 Pleural effusion 87
4.4 Chronic cough and haemoptysis 88
4.5 Chest wall problems 93

5 Back and related limb neurological problems 95
Ming Kon Yii, Andrew Danks and Marinis Pirpiris
5.1 Introduction 95
5.2 Back pain 99
Neurological system 102
5.3 Limb weakness and numbness – peripheral neuropathies 105
Clinical assessment of specific nerve palsies 106
Median nerve 107
Ulnar nerve 108
Radial nerve and posterior interosseous nerve 110
Axillary (circumflex) nerve 110
Brachial plexus 111
Spinal nerve root lesions (cervical) 111
Lower limb: common peroneal nerve 111
Posterior tibial nerve 112
Sciatic nerve 112
Femoral nerve 112
Lumbo-sacral plexus and roots 112
5.4 Limb weakness – other causes 113
Weakness with wasting 113
Weakness without wasting 114
CNS lesions – hemiplegia 114
Spinal cord lesions – paraplegia or quadriplegia 115

6 Limb problems 117
Ming Kon Yii and Marinis Pirpiris
6.1 Introduction 117
Arterial circulation 117
Venous circulation 118
Neurological system 119
Musculoskeletal locomotor system 120
6.2 Bony lumps 120
6.3 Musculotendinous lumps 125
Muscle swellings 126
Tendinous swellings 126
6.4 Painful shoulder 130
6.5 Pain in the upper limbs 133
6.6 Subcutaneous hand lumps 134
6.7 Hand deformities 138
6.8 Hand infections 145
6.9 Nail disorders 149
6.10 Painful hip 152
6.11 Painful knee 155
6.12 Painful foot 159
6.13 Swollen leg 163
6.14 Leg ulcer 167
6.15 Varicose veins 173
6.16 Limb ischaemia 177
Functional ischaemia – intermittent claudication 177
Critical ischaemia – rest pain, gangrene or ulcer 180
Acute limb ischaemia 184
Raynaud’s phenomenon 185

7 Abdomen and gut problems 187
Alan Saunder and Ken Farrell
7.1 Introduction 187
History – analysis of abdominal pain 187
Physical examination 189
7.2 ‘Acute abdomen’ (acute abdominal surgical emergency) 193
7.3 Acute upper abdominal pain 203
7.4 Acute right iliac fossa pain 208
7.5 Acute lower abdominal (pelvic) pain 213
7.6 Chronic epigastric pain 217
7.7 Chronic lower abdominal (pelvic) pain 223
7.8 Bowel obstruction 227
Initial assessment: small or large bowel obstruction? 227
Small bowel obstruction 227
Large bowel obstruction 232
9.9 Abdominal mass 235
Right upper quadrant mass 237
Hepatomegaly 240
Left upper quadrant mass 241
Splenomegaly 241
Combined liver and spleen enlargement 242
Epigastric mass 243
Right iliac fossa mass 244
Left iliac fossa mass 245
Abdominal swellings arising from the pelvis 246
7.10 Abdominal distension 246
7.11 Retrosternal pain and heartburn 249
7.12 Dysphagia 253
7.13 Weight loss 259
7.14 Vomiting 261
7.15 Jaundice 265
7.16 Haematemesis and melaena (upper gastrointestinal haemorrhage)  271
7.17 Acute lower gastrointestinal (colonic) haemorrhage  277
7.18 Iron deficiency anaemia  279
7.19 Bleeding with defaecation (anorectal bleeding)  282
7.20 Altered bowel habit (constipation)  287
7.21 Diarrhoea  291
7.22 Acute anal pain  297
7.23 Anal pruritus  301
7.24 Anorectal lump  302
7.25 Anal discharge and incontinence  305
7.26 Pneumaturia  308
7.27 Perianal fistula and sinus  308

8 Groin, scrotum and abdominal wall problems 312

Alan Saunder, Caroline Dowling, Ken Farrell and Mark Frydenberg
8.1 Introduction 312
8.2 Inguinoscrotal lumps  317
  Scrotal lumps  317
  Groin and inguinoscrotal lumps  320
8.3 Abdominal wall problems  324
  The umbilicus  324
  Umbilical discharge  324
  Umbilical swellings and defects  325
  Swellings of the abdominal wall  326

9 Urogenital problems 328

Caroline Dowling and Mark Frydenberg
9.1 Introduction: urinary tract  328
9.2 Loin pain  329
9.3 Painless haematuria  334
9.4 Lower urinary tract symptoms (LUTS)  337
9.5 Poor urinary stream  340
9.6 Urinary retention  344
9.7 Urinary incontinence  346
9.8 Penile lesions  348

10 Preoperative medical problems in surgical patients 352

Julian Smith and Ming Kon Yii
10.1 Introduction  352
10.2 Assessing patients for surgery  352
10.3 Cardiac disease  355
10.4 Respiratory disease  358
10.5 Cerebrovascular disease  359
10.6 Alcoholic liver disease  359
10.7 Chronic renal disease  362
10.8 Haemostatic and haemopoietic disorders  363

10.9 Anaemia  367
10.10 Diabetes mellitus  368
10.11 Mental health problems  369
10.12 Additional preoperative preparation  372

11 Postoperative problems 375

Ming Kon Yii
11.1 Introduction  375
11.2 Pain  375
11.3 Nausea and vomiting  376
11.4 Tachycardia  378
11.5 Fever  378
11.6 Shortness of breath and tachypnoea  380
11.7 Confusion and altered mental state  382
11.8 Low urine output  382
11.9 Sudden collapse or rapid deterioration  383
11.10 Wound care problems  385
11.11 Abnormal investigations
  Hypokalaemia  387
  Hyperkalaemia  387
  Hydrogen ion (acid-base) disorders  388
  Metabolic acidosis  388
  Metabolic alkalosis  388
  Respiratory acidosis and alkalosis  389

12 Problems in surgical intensive care 390

Tim Crozier
12.1 Introduction: What is intensive care?  390
12.2 Patient selection  390
12.3 Throughput and efficiency  391
12.4 ICU versus high dependency unit care  391
12.5 Postoperative ICU care  391
12.6 Recovery and discharge from the ICU to the surgical ward  394
12.7 General management of ICU patients  395
12.8 Cardiopulmonary arrest  395
12.9 Common problems in the ICU  395
12.10 The dying patient  403
12.11 Limitation of treatment/not for escalation of care orders  403
12.12 Withdrawal of treatment  403
12.13 Brain death and organ donation  403

13 Problems in the injured patient 404

James Lim, Bruce Waxman and Marcel Favilla
13.1 Introduction  404
13.2 Managing the injured patient
  Initial assessment  404
  Primary survey and resuscitation  405
CONTENTS

Investigations and procedures following the primary survey and resuscitation
Secondary survey
Investigations and procedures following the secondary survey
Re-evaluation
Definitive care and transfer
Medical records and documentation
Shock

13.3 Soft tissue injury and wound care
Classification of wounds
Principles of wound healing
Factors adversely affecting wound healing
Definitive care

13.4 Burns
Pathophysiology of burns
First aid
Initial assessment
Subsequent assessment and definitive care

13.5 Head injury
Classification and definitions
Initial assessment
Investigations
Definitive care

13.6 Facial injury
Initial assessment
Definitive care

13.7 Eye and orbital injury
Conical flash burns
Perforating globe injuries
Superficial foreign body injury
Closed globe injury
Injury to the orbit
Injury to the eyelids

13.8 Chest injury
Life-threatening chest injuries

13.9 Abdominal injury
Nerve injury

13.10 Vascular injury

13.11 Urinary tract injury
Renal injury
Ureteral injury
Bladder and urethral injury

13.12 Spinal injury
Classification of spinal cord injury

13.13 Major fractures and joint injury

13.14 Hand injury

Picture credits
Index
Foreword

The seeds for a satisfactory and rewarding career as a medical practitioner are planted in medical school where students begin to develop professional habits that can last for a lifetime. It is here that the important building blocks required to become a competent and caring clinician must first be learned. This occurs through a step-wise process that recognises the importance of each patient as an individual with their own particular set of circumstances.

The integrated curricula of many medical schools place an increasing emphasis on internal medicine yet the generality of surgery may be equally important in considering the timely management of a patient’s illness. For the student or trainee the clinical approach must be the same. This involves obtaining a thorough history, completing a physical examination, developing a differential diagnosis and deciding on a series of investigations and a plan of management. Fundamental to this process is the development of the skill of clinical reasoning in order that judgement and decision making can take place.

The authors of this textbook are to be congratulated for creating a valuable and learner-friendly educational resource that will provide students, trainees and those beyond with the knowledge and clinical approach they require to ensure the delivery of satisfactory health care. Using a problem-orientated clinical approach, each of the subjects is dealt with in a uniform and logical fashion supported by clear and informative diagrams, figures, tables, images and summaries. Details of surgical procedures are provided where necessary for understanding but kept to a minimum.

A unique and welcome approach is the focus on a problem-orientated clinical record and the art of clinical conversation. Clarity in communicating the patient’s problem(s) to another health professional and the proper recording of these facts in the patient’s record is a learned skill that is fundamental to the provision of acute and continuing care.

This easily readable textbook should appeal to a broad spectrum of undergraduate and postgraduate readers. It will be especially helpful for those preparing for examinations where the candidate is required to demonstrate robust skills in clinical reasoning as well as in surgical knowledge.

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3
Breast problems
Jane Fox

3.1 INTRODUCTION

History
Discovering a lump is the complaint of most concern in patients presenting with breast disease. The clinician must answer the questions: Is a discrete (dominant) lump really present? Then, if the answer is yes: Is it a carcinoma? Most carcinomas present as painless lumps. The other common forms of presentation of breast problems are painful breasts (often with general lumpiness), nipple discharge and skin changes.

Also important is a history of: past breast pathology; cyclical changes in the breast, particularly premenstrual tenderness and lumpiness; times of menarche and menopause; pregnancy, contraception and lactation details including the number and dates of pregnancies and complications of lactation such as milk retention, breast abscess, nipple soreness and retracted nipple; and any family history of breast disease.

Physical examination
The fully exposed breasts are examined initially in the seated and then the supine position.

On inspection any asymmetry or alteration in contour of the breasts is noted (Box 3.1). Most differences in size of the breasts are developmental. Accessory nipples may be observed along the milk line between axillae and groins. The most common site is just below the normal breast. Accessory breast tissue is most commonly seen between the true breast and the axilla and may increase in size initially with lactation but is rarely connected to the mammary ducts, although a rudimentary nipple may appear as a pore on the skin.

Localised skin retraction and dimpling is an important sign of infiltration by carcinoma. The breast stroma is traversed by fine fibrous bands that support the breast and have attachments to the dermis and to the fascia over the pectoralis major muscle. Invasive and sclerosing lesions within the breast, by involving these ligaments, can produce tethering and dimpling of the overlying skin.

The patient, while sitting, is asked successively to raise the hands fully above the head, to clasp hands behind the neck, to place hands on hips, to press the hands against the hips and to lean forwards. Asymmetry and distortion by a mass or skin tethering (Fig 3.1) and retraction, are often only detected by movements such as arm elevation or leaning forward, or by tension of the underlying chest muscles. Dermal oedema due to lymphatic obstruction causes a skin appearance resembling orange peel or pig skin (peau d’orange). This sign is a feature of a locally advanced cancer or a local inflammatory lesion such as an abscess or may follow treatment for breast cancer, particularly when the axillary lymph nodes have been dissected and when the patient has received radiotherapy to the conserved

BOX 3.1 CAUSES OF UNILATERAL ENLARGEMENT OF THE BREAST OR BREAST ASYMMETRY
- Benign hypertrophy
- Giant fibro-adenoma
- Sarcoma
- Filariasis
breast. Erythematous discoloration of skin may be due to underlying infection, duct obstruction during lactation or, occasionally, inflammatory malignancy. In the areola the nodules of Montgomery’s follicles are seen. These can sometimes become infected. Bilateral nipple retraction may be a developmental anomaly. A recent history of unilateral nipple retraction suggests underlying breast disease, particularly malignancy or periductal inflammation.

Nipple discharge should be induced, if possible, by segmental compression around the areola, or assessed by examining the stain on underclothing. Spontaneous nipple discharge that is bloodstained or a clear sticky yellow fluid is most commonly due to duct papilloma, but occasionally indicative of serious intraduct pathology, particularly ductal carcinoma in situ. Physiological discharge may be seen in young women and during lactation. A thick creamy or green discharge suggests mammary duct ectasia and is rarely spontaneous. Hyperprolactinaemia due to a microadenoma of the pituitary gland is a rare cause of a copious milky discharge and some psychoactive medications may precipitate nipple discharge due to endocrine interactions. Cytological examination of the fluid may aid diagnosis.

Palpation is initially performed with the patient supine. A pillow is placed beneath the shoulder on the side being examined and the arm on that side is abducted with the hand placed behind the head (Fig 3.2). This spreads the breast over a larger area, reducing the depth of the breast tissue and thus facilitating palpation. The whole breast is palpated, including the axillary tail, using the palmar surfaces of the fingers with the hand flat. This avoids mistaking normal fat or glandular tissue for discrete lumps, a mistake that is common if the tips of the fingers are used. The detection of a discrete or dominant lump requires experience in palpating the normal texture of the breast and recognising the normal and cyclical variation. If a lump is discovered or the patient’s suspicion of a lump is confirmed, its physical characteristics are fully assessed. Many dominant lumps in the breast are cystic so that assessment for fluctuation is important; however, fluctuation will not be elicitable with deep cysts. The important physical characteristics of cancer are discreteness and induration. Fixity is usually a late sign except where a cancer is unusually superficial or in the infra-mammary fold of the breast.

Finally the patient is brought back to the seated position to complete the examination. Any lumps are assessed by palpation with one hand, then by both hands compressing the breast between them. Fixation of the lump to the underlying muscle is tested by assessing for change in mobility upon contraction of the pectoralis major muscle. The patient is asked to press her hand against the hip in order to contract the muscle. The axilla is palpated while resting the patient’s forearm on the examiner’s forearm. Palpable nodes are common in the normal axilla; firm nodes of 1 cm or more suggest involvement by metastatic tumour. Enlarged and tender nodes may indicate an inflammatory or infective process. The examination is completed by looking for signs of metastatic disease, palpation for supraclavicular nodes and for hepatomegaly and bone
tenderness, particularly in the spine, and auscultation of the chest. A diagramatic record can then be made of the findings (Fig 3.3).

**Diagnostic tests**

Percutaneous aspiration of a breast lump is often part of the routine physical examination, both to obtain a cytological specimen for diagnosis and to definitively treat breast cysts. Simple aspiration of breast cysts is both diagnostic and therapeutic. Cytological examination of the greenish-yellow fluid is not worthwhile, but cytology should be done if the aspirate is bloodstained or if the cyst is recurrent or if an ultrasound shows a complex lesion.

**Imaging techniques: mammography, ultrasound**

Imaging of breast tissue commonly utilises mammography and ultrasound. Mammography provides the most sensitive and specific method of screening an asymptomatic woman for signs of breast cancer. Examination of a symptomatic patient generally involves both mammography and ultrasound and ultrasound should be regarded as a focused investigation rather than a screening strategy. High-resolution ultrasound is useful in providing diagnostic information about solid and cystic masses and is increasingly used as a clinical tool to differentiate between ‘lumpy normal’ and breast pathology. Mammography is least useful in breasts with dense glandular tissue in women aged under 30 years. Imaging of dense breast tissue, particularly in women identified at high risk of developing breast cancer, is challenging. At present MRI (magnetic resonance imaging) has promising sensitivity and improving specificity and is of particular use in young women at high risk of breast cancer because of a genetic predisposition.

Positive signs of malignancy on mammography include an irregular infiltrating mass and focal pleomorphic microcalcification. Differentiation of mass lesions and calcified lesions uses a combination of mammographic workup including magnification, ultrasound and image-guided biopsy (Fig 3.4).

**Cytology and histology**

Fine needle aspiration cytology (FNAC) is a very useful diagnostic test in solid lumps. Diagnostic accuracy can be over 90–95%; however, the technique is often not diagnostic and core biopsy for histology is preferred in many centres.

A negative report should never override clinical suspicion.

Histology is more reliable than cytology, provided the site of sampling is accurate – so false negatives for cancer are rare. Open biopsy is the most reliable examination, although it is uncommon for a patient to not have a preoperative diagnosis. It is no longer routine for the extent of a patient’s surgery to be determined by intraoperative frozen section.

Specific markers can be indentified by immuno-histochemistry including oestrogen and progesterone receptors and tyrosine kinase receptors, which are useful in predicting susceptibility to targeted therapies and in predicting prognosis. The development of gene array techniques and proteomics are expected to refine these tests.

**3.2 BREAST PAIN**

Breast pain (mastalgia) is a very common problem and is not often due to malignant disease.

**Common causes**

1. Cyclical mastalgia
2. Focal lesions – inflammation, neoplasia

**Clinical features and diagnosis**

In most instances breast pain is cyclical. This condition is very common. Sometimes the pain is continuous, severe and disabling. There is often a premenstrual increase in pain and lumpiness. The condition is most common between the ages of 30 and 50 years and is unusual after menopause. Breast pain may be cyclical or noncyclical – the former is much more common. The severity of pain varies widely and cyclical pain may be regarded as a minor variation to normal swelling, tenderness and tenseness before or with the period. Severe symptoms may be associated with increased circulating prolactin.

On examination, tender lumpiness is felt in
Figure 3.4 Mammographic and sonographic images of the breast
Mammographic and sonographic images of the breast often demonstrate the features of benign and malignant breast lesions.
(a) Breast cancer typically appears on a mammogram as a focal density with spiculate edges.
(b) Microcalcification can be associated with benign and malignant breast pathology and is graded according to its morphology. Typically malignant calcification is variable in size and shape and may cast the branching pattern of the milk ducts.
(c) Simple cysts may show as a discrete density on mammography, but ultrasound best demonstrates the smooth cyst wall and anechoic cyst fluid.
(d) Fibroadenomas may also appear as a discrete density on mammography and on ultrasound. A benign solid lesion should have more breadth than height.

Courtesy of Dr Manish Jain, MIA
the breast, usually without a dominant lump. The association of a lump will require appropriate imaging and percutaneous cytological aspiration cytology or biopsy; management of the lump in such instances is the main problem. The diagnosis of pain can be established by regular review without recourse to radiological examination or biopsy. Patients are frequently reassured simply to have an explanation for their pain and may not require specific treatment. Appropriate diagnostic and screening tests should be undertaken on the basis of clinical signs and estimated risk of cancer (particularly age).

Treatment plan
Managing breast pain is often difficult. The principles of treatment are:

- Nonspecific measures including analgesia, avoiding trauma and wearing at all times a brassiere that gives good support and protection. A low-fat diet may assist in management and does no harm.
- For patients with severe cyclical pain, many dietary modifications and methods of treatment have been used with variable success. Vitamins B1 (riboflavin) and B6 (pyridoxine) and a diuretic taken for one week prior to the period are commonly used, but their value is difficult to assess and not supported by controlled clinical trials.

Bromocriptine (which reduces the circulating level of prolactin), danazol (an androgen), tamoxifen (a selective oestrogen receptor modulator (SERM) antagonist) and evening primrose oil (a source of essential fatty acid) have all been used with some success. The side effects of prolactin antagonists, SERMs and androgens can be severe and are usually unacceptable in a benign condition unless symptoms are severe. Evening primrose oil has been assessed by RCT and approximately 80% of women with cyclical breast pain respond to treatment, although the effect is not immediate. Danazol is used as a short course of treatment.

3.3 BREAST LUMP
In most instances a lump in the breast is incidentally found by a woman or her general practitioner and may not be a discrete lesion. The breast consists of fat and glandular tissue arranged between fibrous tissue septa. It can be easy to sense a localised area of resistance that is incorrectly considered to be a lump. Squeezing the breast tissue between finger and thumb accentuates the tendency to produce 'pseudo-lumps'.

Confusion can be reduced by the correct method of palpation, which is to palpate gently with the pulps of the fingers with a flat hand. Prodding and squeezing should be avoided in order to better detect the truly dominant lump. Breast examination requires experience before the clinician can be reasonably sure whether a lump is present or not. Greater sensitivity can be achieved by palpation with the breast and fingers lubricated by a thin soap film. Perhaps for this reason, many lumps are first noted by the patient while showering.

If the clinician feels that a lump is not present, the patient can be reassured, but it is important to determine what the patient has identified as a lump, and to consider whether imaging is indicated.

The clinician also may be unsure whether a discrete lump is present or not. When a degree of lumpiness is present, it may be difficult to be sure on the first examination whether there is a dominant swelling in a lumpy breast. In these cases the usual practice is regular review, often timing the next visit at a different time during the menstrual cycle, as lumpiness of breast tissue is commonly a cyclical phenomenon. The natural lumpiness of the breast is least in the early part of the menstrual cycle. Bilateral mammography and ultrasound are also very helpful in these patients.

If the clinician identifies a dominant lump, age is often helpful in suggesting an appropriate differential diagnosis. A variety of common breast changes can be defined by the acronym ‘ANDI’ (abnormalities of normal development and involution). Fibro-adenomas are a developmental abnormality and most commonly present in women in their late teens and 20s and respond to normal growth stimuli. Benign breast cysts are a phenomenon of involution and commonly present between 30 years and menopause. Carcinoma should be considered the most likely cause of a new palpable abnormality in a post-menopausal woman but occurs in young women as well. Thickenings in the region of scars from previous benign breast biopsies can also cause difficulties in diagnosis.

Similarly, a variety of discrete nonpalpable lesions may be detected by screening mammography, although a lump may not be palpable.

Causes
1. Carcinoma
2. Fibro-adenosis
3. Fibrocystic change (breast cyst)
4. Fibro-adenoma
5. Mammary duct ectasia
6. Less common causes
History and physical examination

1. Carcinoma
Carcinoma of the breast is uncommon under the age of 30 years. Thereafter the prevalence of the disease steadily increases to a maximum at the age of about 60 years.

Most patients with carcinoma present with a painless lump in the breast. Symptoms of breast pain, nipple discharge, nipple retraction, generalised enlargement of the breast and axillary swelling are less common forms of presentation.

Symptoms of metastatic disease may be present at diagnosis, although the majority of cancers are detected at an early stage (locoregional disease alone).

About half the cancers of the breast occur in the upper outer quadrant. A little less than a quarter are found in the region of the areola.

On initial inspection in the seated position the features sought include a mass or deformity, nipple retraction and dimpling of the skin (often produced by raising the arms above the head). With advanced disease, skin discoloration, nodularity, erythema, oedema of the skin (peau d’orange) and ulceration may be seen.

In the supine position with the shoulder on the pillow, a breast cancer is commonly palpated as a localised, nontender, firm or hard lump with a poorly defined margin. Occasionally the lump is tender. Sometimes there may be evidence of inflammation. Rarely an inflammatory carcinoma presenting with warmth and extensive hyperaemia and oedema can be mistaken for a breast abscess. Such inflammatory carcinomas can exhibit redness involving most of the skin over the breast. The lump is examined for tethering to the fascia of pectoralis major muscle and the axilla is examined for involvement of nodes. Microscopic metastases are present in about one-third of clinically negative nodes.

Although the patient’s complaint of a breast lump may be mistaken, some lumps are so small they cannot easily be felt by the clinician and yet have been discovered by the alert patient. These lesions are generally less than 1 cm in diameter and need to be very carefully sought with the patient’s aid.

Although rare, breast cancer may occur during pregnancy or lactation, when the changes in the breast obscure the true nature of the lesion and lead to a delay in diagnosis. A galactocele may persist as a localised collection of milk after lactation. Diagnosis is made clinically and on ultrasound, but biopsy may be necessary.

Examination is completed by assessing the areas of possible metastatic spread and staging the disease by clinical examination (Box 3.2).

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2. Fibro-adenosis
Fibro-adenosis is a condition leading to coexisting hyperplasia (adenosis and epitheliosis) and involution (fibrosis and cyst formation). Fibro-adenosis is most common in women between 30 and 50 years of age and is much less common after menopause. Dominant lumps indistinguishable from carcinoma may develop. The lumps are often tender and a past history of painful premenstrual lumpiness in the breast is common. Biopsy is necessary to be sure of the diagnosis of any dominant lump.

3. Fibrocystic change (breast cyst)
Macrocystic change is a form of fibrocystic change where cyst formation is marked. Cysts often present as dominant lumps. Pain and tenderness are not common. A solitary cyst is smooth, spherical or domed, tense...
and firm. It may be possible to detect fluctuation. The clinical distinction is important because these lesions can be diagnosed and treated by aspiration at the initial consultation and the patient can be reassured. If aspiration does not provide complete resolution of the lump, if the aspirate is bloodstained, if the mass persists after aspiration or if there is early re-accumulation of fluid, biopsy is indicated.

4. Fibro-adenoma
Fibro-adenoma is a common benign neoplasm of the breast that mainly occurs before the age of 30. It is an abnormality of normal development and is thought to arise from a single breast lobule. Typically a fibro-adenoma is a round, firm, discrete, mobile, nontender lesion about 1–2 cm in diameter (‘breast mouse’) and found in a young woman in her late teens or early 20s. Impalpable fibro-adenomas may be detected at routine breast imaging and multiple fibro-adenomas are not uncommon. An uncommon form of fibro-adenoma occurs in this age group, with a very cellular structure (‘cystosarcoma phylloides’). This lesion is rarely malignant but may enlarge rapidly and recur locally after excision.

5. Mammary duct ectasia
Mammary duct ectasia (‘plasma cell’ mastitis) is a common inflammatory condition of the breast. The condition is associated with duct stagnation and is more common in the years just before menopause. A lump develops when there is extravasation of the duct contents and a localised foreign body inflammatory response with variable degrees of fibrosis. The lump is a firm or hard, tender, poorly defined swelling. The lump is usually found near the margin of the areola, often with surrounding inflammation. Many cases settle down, but often exploration is necessary to make a diagnosis. A localised acute abscess may require drainage. Presentation of later disease with developed fibrosis can mimic the signs of cancer very closely. After exploration, there is danger of a subsequent persistent mamillary fistula if the mass and obstructed ducts are not adequately excised.

6. Less common causes
Lipomas are usually easy to diagnose but, because of their situation, biopsy is often necessary to be sure of the diagnosis. A lipoma is a soft lobulated lesion usually lying near the periphery of the breast in the subcutaneous fat. On compression it tends to slip away from beneath the fingers.

Fat necrosis is of considerable clinical importance because the mass that results is often accompanied by skin or nipple retraction and can be clinically indistinguishable from carcinoma. In most, but not all, cases there is a history of injury to the breast but the trauma may have been unnoticed at the time.

Breast abscess is usually (but by no means always) a complication of lactation. A common sequence of events is for painful duct obstruction to occur. Lactation is suppressed by the clinician and antibiotic treatment is often given. The inflammatory response that follows duct obstruction is not initially due to bacterial infection and should have been treated by expression of milk and continued lactation. In most cases the problem resolves with these measures. In many instances the incorrect use of antibiotics for too long a period has been a causal factor in the development of the abscess (‘antibioma’).

Causes of breast abscess in nonlactating breasts include mammary duct ectasia.

Mondor’s disease is a condition of subcutaneous lymphangitis presenting as a subcutaneous palpable discrete cord just lateral to the breast. It can occur in other areas such as the cubital fossa. It may accompany other breast pathologies, including carcinoma, but usually occurs in a normal breast and is benign and self-resolving. It is now most commonly seen following breast surgery.

Diagnostic plans

1. Fine needle aspiration cytology (FNAC)
Radical surgery for breast cancer should never be undertaken without an unequivocal histological diagnosis of cancer. However, FNAC can provide useful diagnostic information, particularly in confirming benign conditions. When facilities are available, the first diagnostic step is percutaneous aspiration of the lump and cytological examination of the aspirate (FNAC). The needle is inserted into the mass and the plunger of the syringe is maximally retracted. The needle is then moved back and forth in the mass four or five times. Throughout this manoeuvre negative pressure is maintained by keeping the plunger of the syringe retracted. Before removal of the needle the suction is released; the needle is then withdrawn from the lesion. A small drop of aspirated material is placed on to a labelled slide and air dried. An ordinary disposable syringe with a fine needle can be used or a syringe holder that facilitates one-handed aspiration, leaving the other hand free to fix the lump.

2. Mammography
Mammography is the only reliable widely available means of detecting breast cancer before a mass can be palpated in the breast. Experienced radiologists
can interpret mammograms correctly in about 90% of cases.

Indications for mammography are:

- to screen a selected group of women who are at high risk of developing breast cancer, including those who have had a previous breast cancer treated
- to evaluate a questionable or ill-defined mass or other suspicious change in the breast
- to assist in the localisation of the lesion prior to biopsy or surgery.

**Treatment plan**

Dominant lumps require a tissue diagnosis. When the presence of breast cancer is established by core needle histology the treatment plan is as follows.

1. **Clinical staging**

Before surgery the patient’s clinical stage should be assessed. Liver function tests should be performed; liver metastases may only be evident by the presence of an elevated serum alkaline phosphatase. Chest X-rays may show pulmonary metastases but are not a routine staging strategy.

Further preoperative investigations such as bone scanning and a CT scan of the chest, liver and brain are indicated only if metastases at these sites are clinically suspected or if the tumour is locally advanced as evidenced by a mass over 5 cm or if the axillary nodes are palpable and abnormal. Bone scanning has not proved to be of reliable clinical value as a routine preoperative test because of a high incidence of false positive results. The diagnosis and treatment plan are fully discussed with the patient, emphasising treatment options and sufficient time between diagnosis and treatment to consider and clarify these options.

2. **Curative surgical treatment for early disease**

This is potentially possible for patients with stage 1 or 2 disease. Those with stage 4 disease can only receive palliative treatment. Surgery is unlikely to be curative for those with stage 3 disease. In the majority of patients with potentially curable disease the treatment is initially surgical, aiming to control local disease for the life of the patient. The majority of patients can choose between breast conserving treatment, which is a complete local excision of the cancer with histologically clear margins and radiotherapy, or a total mastectomy. A small number of patients require a total mastectomy because of the size of the tumour or because the tumour is multifocal. When the cancer is invasive some form of histological examination of axillary lymph nodes is indicated. Since 2004 sentinel lymph node sampling, using a radioactive tracer or patent blue dye, is the usual practice in clinical stage 1 disease, with axillary dissection reserved for those patients with pre- or postoperative evidence of axillary node involvement. Those patients requiring or electing to have a mastectomy may consider immediate or delayed breast reconstruction with implant or autologous tissue.

Once the complete pathological report is available, further treatment to reduce the risk of systemic recurrence should be considered. This is generally within the context of a multidisciplinary service involving the surgeon, medical oncologist and radiation oncologist, breast care nurse and other health professionals. The treatment may involve chemotherapy, endocrine therapy including SERMs and aromatase inhibitors and targeted therapies such as trastuzumab. In locally advanced breast cancer systemic treatment may be used first in recognition of a high risk of early systemic relapse and to reduce the extent of locoregional disease preoperatively.

4. **Stage IV disease and advanced local disease**

The management of locally advanced and metastatic breast cancer depends on the extent of disease, the patient’s symptoms and the biological characteristics of the tumour. Curative treatment may be appropriate for locally advanced disease but stage 4 disease with distant metastases is currently not curable and treatment focuses on symptom relief and slowing progression. It is recommended that management again be planned in a multidisciplinary context.

3.4 **Nipple Discharge**

In most instances nipple discharge is due to benign breast disease; potentially concerning discharge will be spontaneous rather than expressed. It is not uncommon for some fluid to be expressed either by an individual woman or during mammography, but it is not a recommended part of breast examination.

The patient can usually describe the nature of the discharge or its appearance on the brassiere. Spontaneous bloodstained or serous nipple discharge is usually due to a duct papilloma. Brownish-green or creamy discharge, which can be expressed from multiple ducts and is often bilateral, is suggestive of duct ectasia. It is important to know whether the discharge is unilateral or bilateral, whether there may be a physiological discharge and whether the patient is able to locate the segment of breast from which pressure will produce the discharge.
An opaque milky discharge commonly appears a few days before parturition. A thin transparent white discharge may continue after lactation. In both these situations nipple discharge is not a diagnostic problem. Milky discharge from multiple ducts in a nonlactating breast may occur in rare syndromes associated with hyperprolactinaemia. Occasionally, drugs and contraceptive agents may cause milky discharge that stops when these agents are ceased.

Paget’s disease of the nipple is a rare cause of a minor degree of nipple discharge that may also be confused with eczema (Table 3.1). This condition is an areolar intra-epithelial carcinoma spreading from a deeper intraduct carcinoma.

**Common causes**

1. Duct papilloma
2. Intraduct carcinoma
3. Mammary duct ectasia

**Diagnostic plans**

**Discharge from many duct orifices (often bilateral)**

The most likely diagnoses are benign mammary dysplasia and mammary duct ectasia. A very rare cause is hyperprolactinaemia. Mammary duct ectasia characteristically gives a creamy-white or toothpaste-like discharge and often shows associated retro-areolar inflammation or swelling with nipple retraction. Mammary dysplasia associated with a serous or greenish discharge is more common in premenopausal women. The discharge is often bilateral, arises from many ducts and is most marked just before menstruation. Associated breast lumpiness is common, but a dominant lump needing biopsy is not usually found. Mammary duct ectasia can present as a lump alone, discharge with an associated lump or discharge alone.

**Unilateral bloody discharge from a single duct**

This is usually caused by an intraduct papilloma. Carcinoma is a rare cause and usually presents with an associated lump or mammographically identifiable lesion but is occasionally due to imaging occult ductal cancer in situ. With intraduct papilloma a mass is only occasionally palpable or visible sonographically. It is useful for the clinician to define, if possible, the involved duct by pressure on different segments of the breast around the nipple at the margin of the areola as this may facilitate focused imaging and surgery (Fig 3.5).

**Mamillary fistula**

This produces a purulent discharge from a point away from the nipple. Such a fistula usually results from periductal inflammation and abscess formation, sometimes in association with a specific infection, and occurs in the skin close to the areola. A long history of discharge often dates from a peri-areolar abscess that has been incised or has pointed to discharge spontaneously on to the skin. The nipple is usually inverted and it is generally possible to pass a probe along the tract to a communicating major duct and out through the nipple.

Purulent discharge may originate in a subareolar abscess of Montgomery’s gland. This produces a purulent discharge from a point away from the nipple but within the areola.

**Diagnostic plan**

In the majority of cases the clinical diagnosis is obvious. Cytology of the discharge is indicated, together with breast imaging. Fine needle aspiration cytology or core biopsy for histology of an associated mass may be required. Cytology in duct ectasia will show only

<table>
<thead>
<tr>
<th>TABLE 3.1 Differences between Paget’s disease and eczema of the nipple</th>
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<tbody>
<tr>
<td><strong>Paget’s disease</strong></td>
</tr>
<tr>
<td>Unilateral</td>
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<tr>
<td>Older patients</td>
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<tr>
<td>Not itchy</td>
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<tr>
<td>No vesicles or pustules</td>
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<tr>
<td>Nipple destruction</td>
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<tr>
<td>Palpable lump often present</td>
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<tr>
<td>Mammographic changes</td>
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**Figure 3.5 Nipple discharge**

A spot of fluid is seen to appear from a single duct with pressure on the related breast segment.
inflammatory cells. Ductal epithelial cells or red blood cells suggest the presence of an intraduct papilloma. Rarely, atypical cells or malignant cells are seen with more serious intraduct pathology.

**Treatment plan**

When a defined unilateral mass is present, treatment of the discharge is secondary to treatment of the mass.

With a bloodstained nipple discharge the segment of breast from which the discharge arises should be defined. At operation the responsible duct is probed and excised with an adequate margin (microdochectomy) through a circumareolar incision. Histology will almost always confirm a benign lesion (Fig 3.6).

Bilateral and diffuse nipple discharge with normal mammograms often needs no treatment other than reassurance. Rarely, prolonged nipple discharge in association with mammary duct ectasia may require subareolar disconnection of the ducts.

Mamillary fistula and Montgomery’s sinus are treated by formal excision of the fistula and related duct segment.

**3.5 GYNAECOMASTIA**

Gynaecomastia is a common disorder. It can take the form of either a discrete, palpable subareolar plate of tissue easily distinguished from surrounding fat or a more diffuse mass only slightly different on palpation from the surrounding fat. Early histological examination reveals duct dilatation and epitheliosis. Later the ductules become sparse and embedded in a diffuse fibrous stroma.

Unilateral gynaecomastia is more suggestive of local pathology but may also be due to systemic causes.

**Common causes**

1. Gynaecomastia of puberty and old age
2. Systemic diseases: alcoholic liver disease, renal injury, thyrotoxicosis, previous malnutrition
3. Carcinoma of the lung and other neoplasms
4. Drug-induced gynaecomastia

**Clinical features**

1. **Puberty and old age**

Gynaecomastia can result from an imbalance between circulating oestrogens and androgens, a state most common at the time of puberty. Many normal pubertal boys therefore develop gynaecomastia. In most instances the condition is asymptomatic. Regression usually occurs within one or two years. The prevalence of gynaecomastia also increases slowly in normal adult men and into old age (senile gynaecomastia). Gynaecomastia of minor degree is common. On clinical examination the condition is present bilaterally in up to one-third of normal adult men. Most of these men do not have pain or tenderness and are unaware of breast enlargement.

2. **Systemic disease**

Gynaecomastia is commonly seen with alcoholic liver disease and may be due to oestrogen retention. Up to 30% of males with thyrotoxicosis have gynaecomastia. Tender gynaecomastia may occur during the recovery phase after severe illness or injury, when this has been associated with marked catabolism and weight loss. This condition was called refeeding gynaecomastia when originally noticed in former prisoners of war. It is probably due to hormonal imbalance associated with a sudden return of gonadal function. Refeeding gynaecomastia may also be a factor in the gynaecomastia of patients with renal failure, as it commonly occurs soon after commencement of dialysis or transplantation.

3. **Carcinoma of the lung and other tumours**

Carcinoma of the lung is uncommonly associated with gynaecomastia but should always be considered as a possible cause in high-risk patients who develop gynaecomastia in mid-adult life.

Other tumours, such as hepatoma, adrenal or testicular tumours, are rare causes of gynaecomastia. Carcinoma of the male breast should be considered in patients with unilateral gynaecomastia, but carcinoma is a rare cause of breast enlargement in men. The diagnosis of carcinoma is suggested by a hard painless lump, which is asymmetrical or eccentric in location.
and is associated with signs of fixation or a bloodstained nipple discharge. Axillary nodes may be enlarged.

### 4. Drug-induced gynaecomastia

**BOX 3.3 COMMON DRUGS ASSOCIATED WITH GYNAECOMASTIA**

- Oestrogens
- Androgens
- Methyldopa
- Spironolactone
- Cimetidine
- Marihuana
- Digoxin
- Cytotoxic agents
- Phenothiazines
- Amphetamines
- Tricyclic antidepressants
- Reserpine

A careful drug history is necessary. Drugs are an increasingly common cause of gynaecomastia. A commonly implicated drug is oestrogen, when used either to induce feminisation (often concealed) or as treatment for carcinoma of the prostate. Testosterone administration can also cause gynaecomastia, as can anabolic steroid abuse. Methyldopa, used for the treatment of hypertension, is a common cause of gynaecomastia.

Spironolactone and cimetidine can produce gynaecomastia by competitive displacement of testosterone from its intracellular receptor. Digitalis preparations can also cause gynaecomastia because of their oestrogen-like properties and sometimes because of ‘refeeding’ after control of congestive cardiac failure.

Cytotoxic agents can produce secondary hypogonadism because of testicular damage. A secondary hypogonadal state can also be induced by drugs that act on the central nervous system to raise serum prolactin. Such drugs include phenothiazines, amphetamines, tricyclic antidepressants and marihuana.

### Diagnostic plan

It is not necessary to perform a biopsy on all patients with gynaecomastia. Clinical examination including ultrasound is usually a reliable method of diagnosis. Biopsy is indicated if the lump is firm or hard and in some cases of asymmetrical or unilateral gynaecomastia.

The recent onset of symptomatic gynaecomastia in adult life suggests the need for further investigation. Of greatest importance is a careful drug history. The testis should be examined for neoplasms; chest X-ray and thyroid function tests should be performed.

Screening tests of serum hormone levels are rarely necessary.

### Treatment plan

In many instances (gynaecomastia of puberty,) the condition is transient and reassurance is all that is required. Withdrawal of a potentially offending drug may lead to regression of the lesion. Senile gynaecomastia is treated by reassurance.

If pain or tenderness is severe and persistent, despite analgesia and pyridoxine treatment, or if the appearance is psychologically disturbing, excision should be considered. Anti-oestrogens should not be used, especially for the benign gynaecomastia of puberty.
9

Urogenital problems
Caroline Dowling and Mark Frydenberg

9.1 INTRODUCTION: URINARY TRACT

History
Urinary disease presents with a relatively small number of defined symptoms as presenting problems. Patients may present with lower urinary tract symptoms (LUTS) that are subcategorised as storage or irritative symptoms (urinary frequency, urgency, nocturia, dysuria), voiding or obstructive symptoms (change in strength of the urinary stream) and incontinence. Ongoing obstructive LUTS may eventually present as retention of urine. Haematuria may be due to benign or malignant disease; renal pain (colic) results from obstruction, most often with ureteric calculi. Occasionally there may be recognition of a renal mass. However, the majority of renal masses are now detected as incidental findings on abdominal imaging performed for investigation of often unrelated symptoms. Prostate cancer is increasingly detected in the context of overall health assessments or as a case finding during assessment of LUTS. A careful assessment of the history often suggests the diagnosis, which is usually supported by an imaging modality.

Common pathologies are congenital anomalies, functional disorders and specific malignancies, including those affecting children. Other malignancies of the urinary tract and prostate increase in frequency with age. Urinary tract trauma and infections are common to all ages. Bladder neck obstruction from prostatic disease is the most common problem in the elderly male.

Patients should be assessed for evidence of renal failure (Ch 10.7). Symptoms of chronic renal failure include nocturnal polyuria and a constellation of nonspecific symptoms: anorexia, nausea and vomiting, headache, visual disturbances, lethargy, sallow skin, oedema and general malaise.

Physical examination
Physical examination is often normal in patients with urinary tract disease. Detection of abnormalities involves identification of renal or bladder masses, together with examination of the lower urinary tract in both sexes. Imaging is often then required. Renal masses are usually found to be due to simple renal cysts, tumours or obstruction causing hydronephrosis. Abdominal examination may reveal a unilateral renal mass or the bilateral masses of polycystic kidneys.

A renal swelling has the following characteristics:
- It fills out the flank and loin as it enlarges laterally and downwards. One may be able to get above a focal renal mass, but the upper margin of an enlarged kidney is often indistinct or disappears under the costal margin. In contradistinction to spleen or liver, a kidney swelling’s inner margin rarely crosses the midline (apart from congenital anomalies such as horseshoe kidneys).
- It has a smooth, rounded lower pole.
- It moves up and down with respiration but not usually markedly as liver or splenic enlargements.
- It has a band of colonic resonance over it anteriorly.
- It is bimanually palpable and ballotable – a hand from behind can displace the mass forwards where it is palpated by the hand in front. The
sign is classic of a mobile retroperitoneal renal swelling but can be shared by any large flank swelling such as a very large liver or spleen (Fig 9.1).

Digital rectal examination (DRE) may reveal the changes of benign prostatic hypertrophy, prostatitis or carcinoma of the prostate. The external genitalia should also be examined. As with all physical examination, appropriate consent is obtained and privacy should be provided.

**Diagnostic tests**

Several special investigations are of critical importance. They range from simple examination of the urine (which must never be omitted) to sophisticated functional and imaging tests. Those most commonly employed are:

- urinary examination and its chemical, cytological and bacteriological analyses
- serum biochemistry including estimation of creatinine, urea and electrolytes and PSA (prostate specific antigen) where appropriate
- functional tests determining total renal function and that of individual kidneys and the adequacy of urine flow and its dynamics; nuclear medicine has facilitated assessment of renal function, using radionuclides such as technetium 99-MDTPA and MAG3 (mercaptoacetyl triglycerine) to measure glomerular filtration rate
- intravenous urography, retrograde and antegrade pyelo-ureterography, cystography and urethrography; nonionic radiological contract agents have significantly increased the safety of these investigations
- cysto-urethroscopy (Figs 9.2a, b and c)
- ultrasound, plain X-ray and computed tomography, angiography and MRI.

**9.2 LOIN PAIN**

The most common cause of loin pain is acute or chronic renal pain. Acute obstruction with dilatation of the urinary tract above the bladder causes acute renal pain (*renal or ureteric ‘colic’*) that has a wide distribution. Pain often radiates from the flank on the affected side to the anterior abdomen and groin and may extend into the penis or scrotum, or labia in females, or into the upper thigh (Fig 9.3). It is severe and prostrating in character and although described as ‘colic’ is usually continuously and unremittingly severe until relieved. Renal ‘colic’ is due to ureteric obstruction by stone, crystal, blood clot, necrotic papilla or infective debris, or back pressure due to a neuropathic bladder. Chronic renal pain gives a dull loin ache and can be due to a variety of renal and perirenal causes.

![Figure 9.1 Palpation of right kidney](image)

![Figure 9.2a Cystoscopy and ureteric catheterisation](image)

A: tip of cystoscope with elevating bridge; B: trigone of bladder; C: ureteric orifice; D: interureteric bar

![Figure 9.2b Normal right ureteric orifice as seen on cystoscopy](image)
Causes

1. Renal pain (colic)

Acute renal colic is usually unmistakable because of: the location of the pain and its radiation from flank to abdomen and groin; its acutely severe and unremitting character (despite its description as colic, it is frequently constant); an associated urge to void (usually indicating stone in the lower or intramural ureter); microscopic or macroscopic haematuria; and the response to the pain by the patient, who usually walks, bends or rolls about in an effort to obtain relief. The patient looks pale, sweats and may vomit. The pain is often characterised as the worst pain ever experienced. Examination may reveal tenderness in the renal angle or a tender renal swelling. The urine usually shows blood macroscopically or on chemical testing (dipstick), with numerous red cells on microscopic examination.

2. Pain referred from the ovary or other abdominal viscera

It is important to distinguish renal colic from other causes of abdominal pain, particularly those that may be imminently life-threatening such as leaking abdominal aortic aneurysm or ectopic pregnancy. Ovarian pain, as from a twisted ovarian cyst, can sometimes be confused with renal pain because of its similarly wide distribution, but associated gynaecological symptoms, pelvic tenderness and an ovarian mass will usually enable the two to be easily distinguished. Pain referred from other sources, such as dissecting or leaking aortic aneurysm or thoracolumbar nerve root pain, is usually distinguishable by associated signs of vascular occlusion or locomotor abnormality. Renal pain with a predominantly abdominal component may occasionally be confused with acute cholecystitis, diverticulitis or appendicitis when those organs are sited in a lumbar position. These and other causes of severe abdominal pain, such as perforated ulcer, are usually distinguishable because of associated clinical features and signs of peritonitis and because such patients lie still with the pain.

3. Musculoskeletal pain

Pain from the lower thoracic spine can be felt in the lumbar region. The onset of musculoskeletal pain (unless traumatic) is less acute than renal colic and is exacerbated by standing, heavy lifting and twisting movements. The acute pain of lower thoracic intraspinal disease is also made worse by coughing and sneezing and often relieved by rest. Examination will usually reveal local tenderness and deformity of the spine. Muscular injury or strain in the lumbar region can be confused with renal colic but the history of injury is usually diagnostic.

4. Less common causes

Renal ‘coli’, without objective evidence of obstruction...
and requiring repeated narcotic injections without relief, should raise suspicion of narcotic addiction but this should always be a diagnosis of exclusion. Such patients may discolour their urine with blood obtained from finger-prick to make the clinical picture more convincing. Occasionally herpes zoster (shingles) may present with loin pain.

**Diagnostic plan**

On presentation to hospital, the diagnosis is usually made after clinical history, examination and then urine dipstick with a commercial kit with positive for red blood cells is demonstrated and infection largely excluded by the absence of nitrites. The imaging modality to confirm the diagnosis will then usually be a non-contrast spiral computed tomography (CT) scan of the abdomen and pelvis. An accompanying plain abdominal X-ray is helpful in planning treatment and elucidating if the stone is radio-opaque or radiolucent. The X-ray may demonstrate an opaque calculus (85% of urinary calculi are radio-opaque – Box 9.1), which needs to be distinguished from phleboliths and other opacities. The CT findings consistent with an obstructing stone include perinephric fat stranding, dilatation of the renal pelvis and/or ureter and identification of the stone itself. The presence of the contralateral kidney should be sought and the size and position of other calculi that appear bright white should be noted. Urine should then be sent for formal microscopy and culture to definitively exclude infection and quantitate the haematuria, and to look for crystals (oxalate). At the time of presentation, blood should be drawn for full examination, creatinine, urea and electrolytes to ascertain renal function and screen for metabolic abnormalities and serum uric acid; calcium and phosphate estimations are also useful screening tests for major metabolic abnormalities. Stone analysis is done if the stone is recovered. The patient is instructed to strain the urine to check for stone passage and obtain the stone for analysis.

**BOX 9.1 TYPES OF URINARY CALCULI**

- 70% are calcium oxalate and phosphate in acid urine (radio-opaque)
- 15% are urate calculi in acid urine (radiolucent)
- 10% are magnesium ammonium phosphate in alkaline, usually infected urine (radio-opaque)
- 1% are cystine (partly radio-opaque)

Prior to the popularity of CT for diagnosis, which has the advantages of high sensitivity, speed, lack of contrast administration and ability to detect other intra-abdominal pathologies, intravenous urography (IVP) was used to confirm the diagnosis of urinary obstruction, with demonstration of the causative calculus, either as a radio-opaque shadow in line with the ureter or as a radiolucent filling defect (Figs 9.4a–c), or showing a dilated upper urinary tract as the aftermath of a stone that has passed. IVP is now rarely performed in most emergency departments but is a useful adjunct if the diagnosis is equivocal. Ultrasound can be helpful in excluding other intra-abdominal and pelvic lesions or to demonstrate and serially monitor upper urinary tract dilatation due to obstruction. Ultrasound is thus of particular value in children, in whom repeated X-rays should be avoided. Renal colic with symptoms and signs of pyelonephritis (fever, systemic toxicity) always requires urgent imaging. An obstructed and infected kidney requires urgent relief, whereas obstruction in the absence of infection can be observed over the course of a week or more without likelihood of renal parenchymal damage.

**Treatment plan**

**Renal colic**

Parenteral narcotic injection is required for pain relief. Intravenous pethidine or morphine relieves pain within a short time and a protocol of administration is...
usually followed in the emergency department. In most instances the pain settles after adequate administration of initial narcotic and a period of observation in the emergency or short-stay ward. Adequate antiemetic should be given with the narcotic. Oral nonsteroidal anti-inflammatory drugs (NSAIDs) should be given with the initial narcotic (e.g. indomethacin 100 mg) and these can be given as suppositories if the patient is not tolerating oral medication. Precautions should be taken in those with a history of peptic ulcer disease. NSAIDs are a very effective form of pain relief in renal colic and can be continued as an outpatient. The patient can also be given oral narcotics such as paracetamol.

Management of urinary calculi
Most urinary calculi pass spontaneously, especially if they are small or less than 5 mm. Treatment is therefore initially expectant. The patient is treated with euvolemma, as pushing fluids will exacerbate pain, and observed at regular intervals by repeat imaging; a plain film if the stone was initially visualised this way will suffice. Additional CT, ultrasound or IVP may be necessary to confirm if the stone has passed. If the stone enters the bladder its spontaneous passage is usually assured; occasionally a stone subsequently impacts in the urethra causing acute stoppage of the urinary stream. Conservative management may be supported by agents that aid stone passage by ureteric relaxation such as an alpha-blocker (e.g. tamsulosin) or calcium channel antagonists (verapamil) alone or in combination.

**Indications for stone removal** (Box 9.2). Removal is indicated only when parenchymal damage is a concern, for example, with unresolved urinary infection or the stone seems very unlikely to pass spontaneously, as with large calculi (> 1 cm diameter) or persisting pain without progress. It is also mandatory in the case of a solitary kidney, where anuria may ensue.

**BOX 9.2 INDICATIONS FOR REMOVAL/DISRUPTION OF SYMPTOMATIC RENAL OR URETERIC STONE**

- Solitary kidney
- Persistent symptomatic obstruction with urinary infection and danger of renal parenchymal damage
- Large calculus (> 1 cm) that is unlikely to pass spontaneously
- Persistent symptomatic obstruction without improvement or onward passage over one or two weeks
Methods of stone removal. Stone removal is largely an endoscopic procedure via the upper or lower urinary tract depending on the site of the stone, with or without the use of an energy source to shatter the stone prior to removal (Fig 9.4d). The other key method of removal is extracorporeal shock wave lithotripsy (ESWL, Fig 9.4e). Rarely is open stone removal required (open ureterolithotomy, pyelolithotomy or anatrophic nephrolithotomy). Laparoscopic surgery may now be used for difficult, large, impacted ureteric stones that cannot be manipulated up or down. The following methods are most frequently used in the operative management of urinary tract calculi.

Cystoscopy and ureteroscopy with stone basket extraction is suitable for small calculi in the lower or intramural ureter that fail to pass despite persisting pain. Energy sources commonly used to fragment the calculi may include pneumatic lithotripsy or laser (holmium). The patient may require temporary stenting with a flexible, double J pigtail stent to guard against recurrence of colic from the oedema left by the stone itself or the procedure to remove it, which can be removed under local anaesthetic at a later date. Stent symptoms include frequency, urgency and loin pain, especially with voiding (stents cause reflux) and haematuria. Patients should be assessed for infection, bearing in mind a degree of red and white cell loss in the urine is consistent with the stent itself.

Extracorporeal shock wave lithotripsy (ESWL). A semi-ellipsoid reflector is used and shock waves are generated from the near focal point and directed to the distant focal point to converge on the calculus in the kidney or upper ureter to fragment it. Many shock waves are required (2500 to 3000) and patients are maintained under anaesthesia or with an epidural block to maintain constant position. Stones can usually be adequately fragmented at one sitting. Most fragmented stones will then be passed spontaneously and subsequently most patients remain stone-free. About 10% of patients require additional percutaneous, ureteroscopic or open surgery to remove residual renal or ureteric fragments. Stones in the middle or lower ureter are shielded by the bony pelvis and need to be manipulated into the pelvis or upper ureter if ESWL is to be used.

Percutaneous nephrolithotomy. A percutaneous nephrostomy tract is first established and a nephroscope introduced along the tract. Small stones are removed with grasping forceps; larger stones are initially fragmented with an ultrasonic lithotriptor.

Percutaneous stone surgery and, more recently, ESWL have revolutionised management of renal stones. Most upper tract stones can now be removed by ESWL or percutaneous and endoscopic means. If all modalities are available, ESWL is successful for most stones and percutaneous techniques can deal with almost all the remainder.

Management of recurrent urinary calculi

Recurrent urinary calculi require reinvestigation with 24-hour urine collection and serum biochemistry to identify:

- idiopathic hypercalciuria (the most common abnormality)
- hyperparathyroidism
- renal tubular acidosis
- metabolic disorders – cystinuria, hyperoxaluria
- urinary tract obstructions and infections
- hyperuricosuria.

Recurrent calculi are prevented by the general measures of maintaining dilute urine of high volume, including fluids at night, and by eliminating obstructions, infections and immobilisation. More specific measures include treatment of hypercalciuria by low-calcium diet and diuretics, of hyperparathyroidism by parathyroidectomy, of renal tubular acidosis by correction of acidosis and by making the alkaline with oral sodium and potassium bicarbonate treatment and of hyperuricosuria by allopurinol, restricting
protein and alcohol intake and alkalinising the urine. General measures for those with no specific metabolic abnormality include maintaining a high fluid intake, avoidance of a high intake of animal protein and salt and oral preparations that are usually citrate-based to act as an inhibitor of stone formation.

9.3 PAINLESS HAEMATURIA

This symptom must always be taken seriously. Haematuria, particularly if painless, should always raise the suspicion of a malignancy and demands full investigation and imaging of the urinary tract to exclude this cause. An underlying urological malignancy is most likely when bleeding is macroscopic and painless. It occurs more often in people over 45 years, particularly in males with a history of heavy cigarette use. Benign prostatic hypertrophy is the most common source of haematuria in men over 60 years. Haematuria is common in painful conditions such as stone and cystitis. The differential diagnosis in these cases relates to the dysuria or loin pain; haematuria is usually a secondary problem. Haematuria may be microscopic and only detected on routine chemical (dipstick) or microscopic examination. Menstrual bleeding may be mistaken for haematuria in females. Haematuria needs to be differentiated from biliuria and from dietary and drug causes of reddish discoloration of the urine. Haemoglobinuria or myoglobinuria, from intravascular haemolysis or rhabdomyolysis, cause a dark urine that is positive for blood on clinical testing.

Causes

Painless haematuria has a number of common and less common causes (Fig 9.5).

1 Renal and urothelial tumours
2 Prostatic hypertrophy
3 Acute glomerulonephritis
4 Bleeding disorders – anticoagulants, thrombocytopenia
5 Less common causes

Clinical assessment and urine microscopy

In localising the most likely source of bleeding, help may be obtained from the history and by urine microscopy. Macroscopic haematuria arising from kidney or ureter is usually dark or smoky and evenly mixed with the urine. Blood entering from the bladder, prostate or urethra is usually brighter red. Bleeding from the bladder may be evenly mixed or terminal. From the prostate, bleeding may be heaviest initially or terminally; urethral bleeding is usually heaviest initially. Bleeding from the urethra or prostate may appear at the external urethral meatus apart from micturition and cause bloodstaining of underpants or pyjamas. It should be noted if clots are present; threadlike clots may signify upper tract bleeding. These characteristics are, however, only rough guides to the source of bleeding. The history taken must also check for other evidence of a bleeding tendency, drug intake including analgesics, recent streptococcal sore throat, oedema of face or limbs, family history and evidence of renal injury. Examination will concentrate on identifying renal masses or evidence of diseases associated with haematuria and should include taking the patient’s blood pressure, which may be elevated with glomerulonephritis. Commonly, a physical examination is unrewarding in finding a cause for haematuria.

Normal urine shows fewer than four erythrocytes per high power field in microscopy of fresh centrifuged specimens. Microscopy of a fresh specimen can distinguish between glomerular and urothelial erythrocytes. The former are irregular in outline and haemoglobin content (dysmorphic). The latter are usually undamaged circular cells with normal haemoglobin content or ghost cells of normal shape lacking haemoglobin. Dysmorphic cells are most easily
recognised under phase-contrast microscopy. The presence of red cell casts or heavy proteinuria is also indicative of glomerular disease.

**Diagnostic and treatment plan**

Cases of haematuria require full investigation and the following are suggested.

- Urine microscopy and culture and urine cytology are indicated.
- Conduct a full blood examination and coagulation studies where clinically indicated (prothrombin time, partial thromboplastin time); these may reveal a systemic cause.
- Carry out renal function tests (serum creatinine and urea).
- Imaging: IVP remains the gold standard for investigation of haematuria, but has largely been superseeded by CT/IVP. However, most patients will undergo an initial ultrasound of the renal tract, which has the advantage of being a fast, easy, safer screening tool that will also delineate parenchymal renal masses and give superior views of the bladder, where a small urothelial tumour may be found. The patient is then referred for intravenous urography with an after-micturition cystogram in the event that all other investigations are negative and the possibility of a small renal pelvis or ureteric lesion cannot be excluded. In most instances this is now done with a CT/IVP with CT performed, contrast given and coronal IVP-like images of the renal pelvis and ureter reconstructed.
- Cystourethroscopy to identify urethral or bladder causes or to localise the source of bleeding to one or other kidney is critical. Cystoscopy cannot be omitted from the assessment and for microscopic haematuria or cases of macroscopic haematuria where the bleeding has subsided and the ultrasound is unrevealing, this is most frequently done as a local anaesthetic flexible cystoscopy.
- Retrograde pyelourethrography and renal angiography may also be required if the diagnosis is still unclear and the bleeding persists.

Macroscopic haematuria must be considered as being caused by a urinary tract malignancy until proven otherwise. If macroscopic haematuria remains unexplained after full investigation, the urine should be examined frequently for malignant cytology and investigations repeated in a month.

Treatment depends on the cause. Haematuria rarely causes shock requiring transfusion or iron deficiency anaemia, except after trauma.

Microscopic haematuria is investigated along similar lines, but often percutaneous renal biopsy will be necessary to identify glomerular lesions.

Bleeding due to prostatic hypertrophy, acute glomerulonephritis, bleeding disorders and less common causes, such as renal papillary necrosis, hydronephrosis, congenital renal anomalies and renal tuberculosis, will usually be associated with other diagnostic features on clinical assessment and investigations.

**Urothelial tumours**. Urothelial tumours are usually transitional cell tumours. The rare, squamous cell carcinoma follows chronic infection and urolithiasis.

Transitional cell tumours result from diffuse and multicentric epithelial dysplasia, often secondary to urinary carcinogens. Cigarette smoking and heavy analgesic consumption are the common risk factors. Exposure to organic solvents in the dye and paint industries is a further risk, as is chronic bilharzial (schistosomiasis) infection in endemic areas. Tumours occur after middle age and are more common in men.

The bladder is the most frequent site but all urothelium is at risk. Tumour malignancy and prognosis exhibit a spectrum from fronded papillary tumours of low grade or medium malignancy that do not invade the lamina propria, to those that are sessile, ulcerated and invasive from the onset. These latter tumours spread by direct invasion, via lymphatics and at a later stage by the bloodstream. Simple staging into superficial disease and muscle-invasive disease is helpful in determining treatment and prognosis (Figs 9.6a and b).

More precise staging is from Ta/T1 to T4, namely:

- Ta – papillary, epithelial confined
- Tis – carcinoma in situ
- T1 – confined to lamina propria
- T2 – invading muscle wall of bladder/muscularis propria/detrusor muscle
- T3 – extending through bladder wall
- T4 – involving other organs or nodal spread

Endoscopic and surgical ablations are the preferred treatments for superficial disease (i.e. Ta and some T1 and Tis). These patients require permanent, repeated urinary cytology and endoscopic review to monitor progress.

Deeper tumours extending into the detrusor muscle need surgical resection with radical cystectomy and diversion of ureters to an ileal conduit or in some circumstances to a neobladder created from a bowel segment. Radiotherapy and endoscopic removal may be used as primary therapy in muscle-invasive disease with or without chemotherapy but is more often reserved for those unfit for radical surgery.
Radiotherapy is particularly helpful for palliation of advanced disease. Intravesical immunotherapy (BCG) or chemotherapy can control superficial and multiple bladder tumours and is usually indicated for Tis, recurrent Ta and some cases of T1 disease.

The BCG is given as an instillation after the insertion of a catheter with an aseptic, and in particular an atraumatic, technique. A six-week course of once weekly instillation is usually undertaken; in some cases a maintenance schedule is given beyond this. BCG is usually well tolerated but has some significant side effects including sepsis (usually in association with concurrent bacterial UTI and/or traumatic catheterisation), common local side effects such as dysuria, frequency, macroscopic haematuria or less commonly granulomatous prostatitis, epididymo-orchitis and rarely in the long term, a small contracted bladder. Uncommon systemic side effects, such as pneumonitis, arthritis and hepatitis, are fortunately rare. For the prevention of potentially life-threatening sepsis all patients undergo urinalysis to check for infection prior to treatment each week and treatment is delayed if infection is detected.

**Renal transitional cell carcinoma** is most common in association with analgesic abuse and presents as haematuria or colic. Treatment is by nephroureterectomy with excision of a cuff of adjacent bladder. This is now more frequently laparoscopically assisted.

**Renal cell carcinoma (RCC).** RCC is an adenocarcinoma that is more common in men and in smokers, occurs usually after middle age, and spreads by direct extension into perinephric fat, the renal vein and vena cava and via lymphatic spread to locoregional nodes. Metastases to lung, adrenal or bone are the most common sites of advanced disease and may be solitary in nature.

RCC used to present with a classic triad of haematuria, pain and a renal mass. All are features of relatively advanced disease. However, the most common presentation now is occult disease found on imaging initiated for investigation of an unrelated problem such as upper abdominal discomfort, back pain or voiding symptoms. Rarely will a patient present with one of the paraneoplastic syndromes associated with RCC such as pyrexia of unknown origin (PUO), anaemia, hypercalcaemia or symptoms due to synthesis of hormones by the tumour (e.g. erythropoietin, renin, parathyroid hormone). As a result of the plethora of paraneoplastic syndromes associated with RCC, it is sometimes termed ‘the physician’s tumour’.

Investigation needs accurate imaging by triple-phase CT of the abdomen and pelvis to delineate the lesion and any locoregional invasion of nodes or veins or to identify adrenal or liver metastases and assess the contralateral renal unit for presence, size, stones, synchronous cancer or other pathology. Occasionally an ultrasound is also required if there is difficulty differentiating between a solid tumour and a solitary renal cyst (the most common mass lesion in the kidney). Rarely, percutaneous needle biopsy or cyst aspiration is required. Plain chest X-ray or chest CT is used to detect metastases.

The usual treatment is radical nephrectomy if the tumour is locally confined. Small RCCs are often now managed with laparoscopic radical nephrectomy. Where there is a requirement for nephron-sparing surgery, for example, in a single kidney, a partial nephrectomy can be performed. Cancer-specific survival figures for the management of small RCCs of less than or equal to 4 cm with partial nephrectomy.
are now equivalent to those for radical nephrectomy, making partial removal an alternative. Occasionally, radical nephrectomy can be combined with removal of a locally resectable single-lung metastasis.

Prognosis is good for small tumours, especially those less than 4 cm and even those up to 7 cm. If, however, there is extensive, histologically poorly differentiated (especially sarcomatoid) or metastatic disease, the prognosis is poor. About one-third of patients have metastases on initial diagnosis. Other poor prognostic parameters are lymph node spread and spread beyond the renal capsule. Renal vein extension at the time of nephrectomy has less prognostic significance and removal of intravenous extension of tumour is worthwhile. The tumour is resistant to radiotherapy and traditionally has been highly chemoresistant, though newer immunotherapy and tyrosine kinase inhibitors (sorafenib and sunitinib) based therapies are showing some promise with regard to small improvements in survival time for those with metastatic disease.

**Wilms' tumour (nephroblastoma).** This is the second most common abdominal neoplasm of childhood and occurs in children under six years of age (mean age at presentation 3.5 years). Presentation is most frequently because of increased abdominal girth, abdominal mass or serendipitous finding on ultrasound performed for other indications. Children may have microscopic haematuria (25%) but macroscopic haematuria is uncommon.

Imaging by ultrasound usually enables the differentiation to be made from a hydronephrotic or cystic kidney and gives information on renal vein or caval involvement. CT or MRI scan of the abdomen and chest will confirm the diagnosis and provide staging information about retroperitoneal and lung involvement. Wilms' tumours may be hereditary or sporadic and may be bilateral.

These tumours may be classified as having either favourable or unfavourable histology. They are sensitive to radiotherapy and chemotherapy and usually managed with a combination of surgery and chemotherapy. (In the US, most will have surgery followed by chemotherapy. In Europe and Australia, most will have induction chemotherapy to shrink the tumour, followed by surgery. Radiotherapy is reserved for chemoresistant tumours.) Prognosis has improved with multimodal therapy and high cure rates are possible.

Neuroblastoma is a common tumour in infants and children. It is a malignant tumour of the autonomic nervous system, particularly the adrenal gland. It usually presents younger than Wilms' (mean age at presentation 1.5 years) and often occurs in neonates. It can be confused with Wilms' tumour initially, with a rather similar clinical picture. However, these children are usually more unwell, with anaemia, weight loss, irritability, fever and pain. They have high levels of urinary vanillylmandelic acid (VMA) and the mass can extend across the midline and around major vessels. A neuroblastoma displaces the normal kidney and is often calcified. Surgical biopsy and complex chemotherapies are required; however, delayed definitive surgical resection in advanced disease rarely improves the poor outcome for this tumour.

**9.4 LOWER URINARY TRACT SYMPTOMS (LUTS)**

Frequency of micturition is normally influenced by age and sex, social behaviour, climate and fluid intake. A young adult male may pass urine approximately four to five times daily and not be woken from sleep to void. A woman of the same age may normally pass urine somewhat less frequently. In assessing the patient’s normal pattern any increased frequency should be noted, including voiding at night, and the overall assessment is greatly assisted by a voiding diary recording the volume of urine passed at each void and fluid intake for three 24-hour periods. LUTS occur frequently in the community and with equal frequency in men and women. LUTS chiefly comprise symptoms that are related to voiding, such as hesitancy, poor stream or intermittent stream, and those that are related to storage. Storage symptoms include frequency, urgency (the complaint of a sudden compelling desire to pass urine that is difficult to defer) and urge-related incontinence. Increased frequency is a nonspecific symptom common to many conditions of the urinary tract and may result from either increased volume of urine or reduced capacity to store urine. Nocturnal polyuria is an important early symptom of renal injury and diabetes. Dysuria is an irritative symptom that manifests as painful frequency of micturition that is often felt as pain not over the bladder itself but at the external urethral meatus or along the urethra. Dysuria is most often due to infective and obstructive causes. Straining and urgency (strangury) often coexist with painful frequency. Incontinence and enuresis are also considered as LUTS and are explored in the next section.

**Common causes**

1. Urinary tract infection
   - Acute bacterial infection – cystitis, prostatitis
   - Infection with uncommon organisms (tuberculosis and schistosomiasis)
2. Benign prostatic hyperplasia (BPH) with obstruction
3 Detrusor muscle weakness and/or instability
4 Chronic (non-infective) prostatitis
5 Urinary calculi
6 Malignancy: prostate or bladder
7 Neurological disease
8 Urethral caruncle
9 Urinary fistula (vesicocolic)
10 Painful bladder syndrome including interstitial cystitis and urethral syndrome

Clinical features and diagnostic plan
The evaluation of LUTS requires a careful history, and of primary importance in formulating a differential diagnosis will be the patient’s age, sex and associated conditions (such as diabetes or neurological disease) and assessment of whether the symptoms are predominantly obstructive or irritative or both. This can be done in a quantitative way with the use of validated questionnaires such as the international prostate symptom score (IPSS). All patients should complete a voiding diary. Initial immediate evaluation to exclude urinary infection should be performed.

Pneumaturia and faecauluria are striking symptoms that usually cause an early attendance to seek medical help. Foul-smelling urine interpreted as faeculent by the patient may be merely the result of severe anaerobic infection. Other irritant symptoms include urethral discharge or haemospermia – these symptoms usually also cause early presentation.

The management of LUTS after exclusion of infection will depend on the predominant symptoms, the patient’s other medical conditions and their treatment, the presence of any complications such as haematuria or renal impairment and most importantly, the degree of bother caused by the LUTS. Many patients will derive benefit from simple measures such as fluid manipulation, regular bowel actions, medication timing and assistance with mobility or proximity to the toilet. Beyond this the management of some of the most common scenarios is dealt with in the next sections.

Urinary tract infections
LUTS must be distinguished from those similar symptoms that are caused by urinary tract infection. Frequency and dysuria in females are often due to cystitis. Infections are more common at various ages. They can occur in neonates and children, become more common when sexual activity commences, may complicate pregnancy and have a final peak after the menopause. Urinary infections in males are usually a consequence of instrumentation but always demand full investigation for another originating cause. Congenital anomalies (urethral valves, hydronephrosis) can present at any age. Obstruction and stasis are potent causes of urinary infection; the other risk factors for infection are stones and reflux. Where appropriate – and especially in males – such risk factors must be detected and treated. Other complications of a lower urinary tract infection in males are prostatitis and epididymo-orchitis, which in the younger male may mimic testicular torsion, a urological emergency. Symptoms and signs of renal injury may be present in these patients.

Physical examination is usually nonspecific and not diagnostic but should never be omitted and should include an abdominal, genital, perineal, digital rectal examination (DRE) and vaginal examination where appropriate, after consent and in the appropriate setting. Urethral caruncle is common in postmenopausal women and can present as dysuria and it is simple diagnoses like this that are missed if the physical examination is inadequate.

Symptoms of dysuria require urine microscopy and culture. Urinary tract infections are more common in females and occur in all age groups. Most are caused by enteric Gram-negative organisms (Escherichia coli, Proteus species, Pseudomonas, Klebsiella, Enterobacter), some by Streptococcus faecalis and occasionally Staphylococcus aureus. Most originate in the commensal flora of the bowel and enter the urinary tract by the ascending route. The bladder’s resistance to infection depends on complete emptying with voiding and the anti-adherent property of its urothelium to organisms.

Most cases of pyelonephritis are also seen in women. Primary or secondary (to obstruction) vesico-ureteric reflux is a common factor that leads to ascending infection. In these cases dysuria is accompanied by fever and chills and a dull ache in the loin.

Ascending infection from the bladder can cause acute pyelonephritis, particularly if vesico-ureteric reflux is present. Acute pyelonephritis may also originate by haematogenous spread. The obstructed kidney is also more liable to haematogenous infection. Obstruction and infection represents a urological emergency.

Pyuria is an abnormal number of leucocytes in the urine (≥4/HPF). Pyuria associated with symptomatic bacilluria with more than 10^5 organisms/mL (or more 5 bacteria per HPF) in a freshly voided and accurately collected midstream urine specimen is indicative of infection.

Sterile pyuria may also be detected and if it is obstructing, lesions such as papillary necrosis and specific infections such as tuberculosis or schistosomiasis should be excluded. Tuberculosis should also always be considered as a possible cause in the case of infection that does not respond to adequate antibiotic treatment.
Treatment of symptomatic urinary infections is with appropriate antibiotics. Investigations must be adequate to exclude obstructions, stones, reflux and tumours as precipitating causes. These will need individual management.

**Lower urinary tract infections**
Females with uncomplicated urinary tract infection do not usually require further investigation unless the infections become recurrent. In males the usual investigations are a renal tract ultrasound with post-void residual bladder volume and further tests according to the suspected diagnosis; these may include voiding flow rate, flexible cystoscopy, urine cytology, serum creatinine urea and electrolytes. More sophisticated urodynamics studies are reserved for specific cases. Most lower urinary tract infections such as cystitis can be cured by a three- to five-day course of treatment with an appropriate antibiotic such as trimethoprim, first-generation cephalosporin or amoxicillin, or as otherwise determined by urine culture and sensitivity. Recurrence is due to reinfection and can be managed by conservative means such as topical oestrogen, cranberry tablets, advice about hygiene and post-coital voiding or, in some cases, simple low-dose daily prophylaxis, which may be required for prolonged periods such as three to six months.

**Upper urinary tract infections**
Upper urinary tract infections such as acute pyelonephritis characterised by loin pain and tenderness, fever and constitutional symptoms require hospitalisation and antibiotics on the basis of urine culture. Severely ill patients will require parenteral gentamicin and ampicillin treatment. All patients should undergo initial imaging to ensure there is not an obvious underlying cause for the obstruction. A renal ultrasound will delineate hydronephrosis and further testing can then be performed, usually CT scanning. Patients with obstructed systems require urgent decompression, most commonly with a percutaneous nephrometry tube and sometimes with insertion of a double J pigtail stent. Apart from the renal parenchymal damage that may be caused by urinary infections, the urinary tract is a potent focus for life-threatening Gram-negative septicemia. Other complications that can occur and require urgent imaging and surgical or radiologically controlled drainage are perinephric abscess or renal abscess.

**Storage LUTS**
Symptoms such as frequency, urgency and urge incontinence are common in the ageing patient, especially females, and relate to altered ability to store urine or in the minority, an overproduction of urine. The most common cause of urinary symptoms in elderly males is bladder neck obstruction. Painful frequency is often associated with difficulties with the urinary stream (Ch 9.5). Where infection has been excluded and there is no other suggestion of pathology, such as haematuria, renal injury, drug-induced diuresis, prior pelvic radiotherapy or neurological condition, the diagnosis is usually an overactive bladder (OAB) secondary to idiopathic detrusor overactivity. This is managed initially with bladder drill and assessment of intake and output, optimally in a multidisciplinary environment with the assistance of continence nurse advisors and physiotherapists. Anticholinergic drugs are also used with caution in the elderly; these act by antimuscarinic means and are associated with side effects of dry mouth, reflux oesophagitis, constipation and dry eyes (e.g. propantheline, oxybutynin). Newer selective agents show promise in their improved side effect profile (e.g. tolterodine, solfenacin). More complex surgical treatment is similar to that for the management of urge-related incontinence.

**Urinary tract pain**
A subset of patients also experience pain associated with the urinary tract, including bladder, urethral, perineal and testicular. This pain can be very troublesome and the cause hard to elucidate, though increasingly pelvic floor muscle tone is thought to play an important role. After assessment of voiding function and exclusion of infection the patient should be assessed for the location, intensity of pain and its precipitants. Bladder pain causes suprapubic discomfort. Prostatic pain is usually vague and poorly localised in the pelvis or perineum. Pain may radiate from the perineum down the inside leg and is sometimes associated with rectal pain and tenderness.

Similar symptoms to urinary tract infection without evidence of infection on formal assessment are commonly seen in young females (painful bladder syndrome). Symptoms may be worse post coitus, after certain foods or with stress. The diagnosis is one of exclusion and may respond to conservative measures with physiotherapy, dietary and fluid manipulation but may require further treatment with cystoscopy and hydrodistention, oral drugs or bladder instillations.

**Voiding LUTS**
LUTS commonly present in the older male who complains about slowing of urinary stream, hesitancy at starting the stream, intermittency of stream and post-micturition dribble. The ultimate complication
of these symptoms is presentation with acute urinary retention. These cases are considered to be voiding LUTS (obstructive) and may coexist with storage (irritative) symptoms, as defined in the previous section. Storage symptoms develop in concert with obstruction as the bladder decompensates due to the ongoing pressure required to expel urine. Females may also experience voiding-related LUTS and atrophic vaginitis can be a potent but curable cause of urethral stenosis. The concept of poor urinary stream and obstruction is discussed in detail in the next section.

9.5 POOR URINARY STREAM

Poor urinary stream is usually due to mechanical obstruction of the lower urinary tract. Poor urinary stream is one of the principal symptoms of voiding or obstructive LUTS. Unrelieved obstruction results in progressive hypertrophy and dilatation of the upper urinary tract and obstructive renal injury. Stasis is often the basis of infection of the obstructed urinary tract.

Common causes

1. Prostatic obstruction
2. Urethral strictures
3. Phimosis and meatal stenosis

Symptoms and signs

In patients with decreased urinary stream the stream is slow to start (hesitancy), lacks power and pressure, may stop and start (intermittency) and dribbles terminally. This may progress to acute or chronic retention of urine. The storage symptom of painless frequency is a common associated symptom. This is often more troublesome at night, is of small volume and often associated with urgency. Urge incontinence in longstanding obstruction, overflow incontinence, may occur. Symptoms of the complications of obstruction may also be present (Fig 9.7a). These include: urinary tract infection with frequency, dysuria and haematuria; bladder diverticula predisposing to cystitis and stone formation; prostatitis and epididymo-orchitis; vesical calculus causing haematuria, dysuria and frequency; and, eventually, renal injury.

Poor urinary stream is most commonly due to outflow obstruction at the bladder neck due to prostatic obstruction in men aged over 60 years, a problem increasing in frequency with the rising proportion of elderly men in the population. Poor flow can also result from urethral stricture or a hypocontractile bladder or a small capacity bladder. The history usually serves to differentiate these less common causes.

On examination the signs of upper urinary tract distension, and of renal injury, are sought.

Figure 9.7a Effect of urinary obstruction

B: transurethral resection. The resectoscope is in position. The diathermy cutting loop is drawn back to remove hypertrophied prostate tissue in layers.

Benign prostatic obstruction

On DRE, the prostate is enlarged, smooth, regular, mobile and soft. Benign prostatic hyperplasia (BPH) is normally present in most males aged over 60 years. A variant is a small muscular prostate, which gives similar symptoms of bladder neck obstruction but the prostate feels of normal size and consistency. Hence the size of the prostate on rectal examination will not always correlate with the degree of symptoms reported (Fig 9.7b).
Carcinoma of the prostate

This increases in frequency with age. It is the commonest noncutaneous malignancy in men, usually arises from the gland periphery and posteriorly and most commonly is an adenocarcinoma. A small malignancy will be felt as a firm or hard nodule within the gland. Later the gland becomes generally hard, irregular and fixed, with extension of the tumour laterally to pelvic structures. Spread occurs by direct extension, the pelvic lymphatics and by the bloodstream to the axial skeleton causing sclerotic metastases. It should be noted that men who present with LUTS uncommonly have prostate cancer and that benign disease is usually the cause, even in situations where cancer may coexist.

Diagnostic plan

Patients with poor urinary stream are considered to belong to the group of patients who have LUTS. Hence their investigation is the same as any patient with LUTS. A full history, examination and urine culture are mandatory. The recording of a voiding diary over three days, documenting the volumes passed and those taken orally, is also extremely helpful, particularly in patients with irritative symptoms. Symptom scores (e.g. IPSS) allow quantification of the patient’s symptoms and a comparison over time of any changes that occur. Further investigation will depend on the result of the clinical assessment and urine culture. A patient with a normal urine culture and non-malignant DRE who is minimally bothered may require minimal intervention.

The following series of investigations are indicated in appropriate patients with poor urinary stream or LUTS:

1. urine microscopy, culture and sensitivity in all
2. urine cytology, upper tract imaging and cystoscopy in those with haematuria detected
3. renal tract ultrasound is performed when information regarding renal anatomy and upper tract changes (e.g. hydronephrosis, stones or tumours), bladder anatomy and post-void residual is sought
4. flexible cystoscopy is performed when urethral anatomy is in question (stricture, previous prostatic surgery) or when bladder pathology needs to be excluded
5. voiding flow rate and residual is a useful adjunct in assessing obstructive LUTS and may give clues to aetiology by its pattern
6. serum creatinine, urea and electrolytes should be performed if renal function is suspected to be abnormal
7. urodynamic assessment
8. prostate-specific antigen.

Urodynamic assessment

Urodynamics is the study of pressure and flow relationships during the storage and transport of urine within the urinary tract. Urodynamic assessment aims to investigate bladder filling and voiding function, accurately define bladder storage disorders and assess the severity of voiding dysfunction. This will be required in those suspected of having bladder dysfunction due to a hypocontractible bladder or with symptoms potentially unrelated to obstruction. This applies particularly to young patients and to those with predominantly storage/irritative symptoms of dysuria, frequency and urgency; these latter symptoms are less likely to respond well to prostatectomy than obstructive symptoms. Patients with a major neurological diagnosis, such as stroke, spinal cord injury or multiple sclerosis, are likely to require urodynamics.

Prostate-specific antigen (PSA). PSA is a serine protease produced by prostate cells and involved in the liquefaction of semen. It is a prostate-specific test that is elevated in conditions that affect the prostate, such as infection, hypertrophy, infarction and malignancy.
As a result it is an imperfect test as a screening tool for prostate malignancy. The current recommendations by the Urological Society of Australia and New Zealand as to who should receive a PSA test reads ‘PSA based testing, and subsequent treatment where appropriate, has been shown to reduce prostate cancer mortality in large randomised studies and therefore should be offered to men after informing them of the risks and benefits of such testing. Valuable predictive information can be obtained through even a single PSA test and prognostic information can be obtained by biopsy where indicated. Where possible, overtreatment should be avoided and surveillance with early intervention discussed with carefully selected patients.1 Hence the test can be offered to fit men with a good life expectancy, with or without LUTS if they are adequately informed prior to the test of its limitations and the likely ramifications of the test returning positive. As this is an area of controversy the reader is urged to refer to the latest literature on the topic and the guidelines produced and updated by their local professional bodies. The upper-most value of the PSA test as normal is also a point of contention but for most purposes, normal is less than 4 ng/ml. However, in a younger male with a small prostate, lower values may be considered abnormal. If concern exists, the patient should be referred to a urologist.

PSA values may be very high in metastatic disease. In the lower ranges of PSA, different ancillary tests may be done to further enhance the specificity of the test. An estimation of the free:total PSA ratio may be helpful in men with a PSA between 4 and 10 ng/mL to further assess their risk of prostate cancer. PSA is usually circulating complexed to binding proteins, with less than 30% found free in serum. In cancer, there is more complexed PSA and less free PSA, leading to a lower ratio than, for example, in BPH. Each laboratory will refer to a particular reference range but a free:total ratio that is low (less than 10%) has up to a 50% risk of cancer being detected. Further manipulations of PSA to increase the positive predictive value of the test include estimations of PSA density (a density greater than 0.15 ng/mL per cc volume of prostate on TRUS estimation confers and increased risk of cancer) and tracking PSA over time to assess the velocity of the PSA rise. A velocity of more than 0.75 ng/mL/year or a doubling time of less than two years is significant for increased risk of cancer.

Bone scan is done as a staging procedure if prostatic cancer is diagnosed. Technetium phosphate complexes have greater uptake in areas of bone formation stimulated by tumour, inflammation or repair. Scans cannot distinguish the various causes of increased uptake, so X-rays of ‘hot’ areas are performed to differentiate Paget’s disease, arthritis and fractures from malignancies. In about one-fifth of bone scans positive for metastases no radiographic abnormality is seen – X-ray changes of metastases are not visible until about half the bone has been destroyed.

Transrectal ultrasound and biopsy (TRUS biopsy). Prostate biopsy is performed for investigation of an elevated PSA or abnormal DRE to detect if prostate cancer is present. It is done with a transrectal ultrasound probe under antibiotic cover, usually with some form of anaesthesia, and usually 8–12 samples or cores of tissue are taken. The Gleason pattern, which describes the histological degree of differentiation in the cancer, is decided from the biopsy and gives prognostic information used in the planning of treatment.

CT scanning of the pelvis and abdomen helps stage malignant disease in some cases.

Treatment plan

1. Prostatic obstruction

Prostatic obstruction due to BPH. Only a proportion of those with symptoms come to surgery. Prostatectomy is indicated if:
- complications of obstruction have occurred – acute retention or overflow incontinence, urinary infections, stones, renal failure or ongoing haematuria
- significant obstructive symptoms exist – hesitancy, poor stream, postmicturition dribbling, and they are bothersome
- significant obstruction exists on investigations – trabeculation of bladder, diverticula, residual urine, upper tract dilatation

Conservative treatment is appropriate for many men with poor urinary stream due to BPH. Some men will require no intervention and a policy of observation may be adopted. Alternative medicines such as saw palmetto, for which there is some published data to support its use, might be used. For men with more bothersome symptoms wishing to avoid surgery, alpha-blockers such as prazosin or the more selective, tamsulosin, may be prescribed. 5HT reductase inhibitors such as finasteride lead to gland shrinkage by blocking the peripheral conversion of testosterone to dihydrotestosterone and can be used in conjunction with an alpha-blocker. They are not widely used in Australia due to side effect profile and

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cost. For men who are poor operative candidates, intra-prostatic stents can also be used but these carry the risk of encrustation and migration.

The operative procedure is now almost invariably transurethral resection of the prostate (TURP) using a resectoscope (endoscopic). The method is suitable for BPH, fibrous prostates or malignant prostates causing obstruction (Fig 9.8a and b).

Complications of TURP include haemorrhage and clot retention, urinary infection and septic shock, stress incontinence and stricture. All patients should be aware that due to the resection of the bladder neck, retrograde ejaculation will result in nearly all cases. Patients may also experience erectile dysfunction after a TURP, though this is thought to be more in keeping with the age-related decline in erections than the surgery specifically and occurs in only around 5% of men. TUR syndrome occurs where there is absorption of the irrigation solution into the bloodstream. This risk is reduced by using isosmolar nonelectrolyte bladder washout solutions. Ablation of tissue can also be achieved using a holmium laser, which has the advantage of using the saline as the irrigant and therefore can treat larger prostates due to a lessened restriction on time of resection.

Alternatives to the traditional TURP with electrocautery include minimally invasive techniques such as microwave therapy or transurethral needle ablation (TUNA) of the prostate. These treatments have less overall impact on symptoms but possibly also less side effects and can be done as a day case. However, they have had a relatively low uptake and have not always proved to be as expeditious as anticipated. Day-case prostatic removal techniques are in constant evolution with lasers (e.g. photoselective potassium titanyl phosphate (KTP) ‘green light’ laser vaporisation) being performed in increasing numbers.

Carcinoma of the prostate. Treatment depends on the stage of disease and the complications caused by local or metastatic disease. Treatment is often undertaken in the multidisciplinary environment and patients may require input from urologists, radiation oncologists, medical oncologists, specialist urological and oncological nurses and palliative care depending on the stage of their disease and the treatment required. Specific complications of advanced disease include acute or chronic retention, painful metastases, pathological fractures and obstructive renal injury.

Prostatic cancer is staged using the TNM system. This is quite complex and for purposes of simplicity, treatment is predicated on whether the cancer is ‘organ confined’ within the prostate or has spread and become advanced and on the patient’s overall health status.

Men who present with early or organ-confined disease, and who are medically fit, will usually be offered treatment with intent to cure. This treatment may be radical surgery with removal of the prostate and re-anastomosis of the bladder to the urethra. Alternatively they may undergo radiotherapy. Both surgery and radiotherapy can take different forms. Surgical removal is commonly open surgery in the extraperitoneal retropubic space with a lower abdominal incision. A perineal approach can be used. The increasing use of laparoscopy and robotics has facilitated surgical removal, with potential improvements in the rate of recovery.

Radiotherapy can be external beam or by placement of low-dose radioactive seeds into the prostate (brachytherapy). High-dose brachytherapy with iridium wires can be administered, usually in conjunction with external beam radiotherapy, in men with higher risk disease.

All radical treatments for prostate cancer carry varying risks to future potency, continence and surrounding structures; for example, rectal toxicity.
associated with radiotherapy. For this reason, extensive pre-treatment counseling takes place to discuss the various risks and benefits of each approach.

A subset of men with low volume and histological low-grade disease may be offered active surveillance for their disease. This is because the biology of these tumours is such that they may not progress and the patient’s eventual death might be due to other causes. This is of particular importance in the older patient or one who is unfit for medical reasons. The decision to undertake active surveillance with regular PSA monitoring, DRE and possibly biopsy is done after careful urological consultation. There is an expectation that in some men, deferred radical treatment will be offered if their disease parameters change during the period of observation. Unexpected malignancy found on TUR is usually well differentiated and of low biological activity and can be followed by active surveillance.

In the case of advanced disease, where the aim of treatment is quality of life, the mainstay of treatment is androgen deprivation. Most prostate cancer begins as a hormone-dependent cancer and the removal of androgens, chiefly testosterone, results in a measurable decline in PSA and a clinical regression of the cancer both locally and distantly. This has not been conclusively demonstrated to prolong cancer-specific survival; however, there is emerging indirect evidence that it might and there are benefits in terms of symptomatic relief and quality of life. Historically, endocrine treatment with androgen deprivation was achieved by orchidectomy but the development of luteinising hormone, releasing hormone agonists that therefore block testicular testosterone production via a feedback loop, have lessened the requirement for orchidectomy, though the two approaches are equally efficacious, but the side effect profile differs marginally. Any form of androgen deprivation is associated with side effects related to the loss of circulating testosterone, in particular, loss of libido and potency, osteoporosis, alteration in haematological and biochemical parameters including anaemia and lipid metabolism changes, altered body fat distribution, hot flushes and changes in executive mental functioning. Patients require ongoing monitoring of these metabolic parameters, which often requires assessment by an endocrinologist.

During the ongoing management of advanced disease patients may require a variety of treatments aimed at improvement of quality of life. These might include TURP for patients with acute retention or those with persisting obstructive symptoms and can control persisting haematuria. Palliative radiotherapy is indicated for painful skeletal metastases uncontrolled by hormones. Intravenous radioisotopes are helpful for more widespread bony metastases but have significant haematologic toxicity.

Newer treatments for advanced disease that may in the future improve longevity include bisphophonates and taxane-based chemotherapy. These agents have some toxicity and are currently under further investigation.

2. Urethral stricture

Urethral stricture is treated according to its site and size and the patient’s age. This may include regular dilatation using graduated sounds, visual urethrotomy with a cold knife or laser via a urethroscope or formal open repair with or without a graft.

3. Phimosis and meatal stenosis

The treatment of phimosis and meatal stenosis is considered in Chapter 9.8.

9.6 URINARY RETENTION

Acute retention of urine causes painful distension of the bladder with inability to void. The diagnosis is usually (but not always) obvious.

Causes
1. Bladder neck obstruction – benign or malignant prostatic disease
2. Urethral stricture
3. Functional causes – after spinal anaesthesia and pelvic operations
4. Less common causes

Clinical assessment

Retention may be acute or chronic. Acute retention is associated with a painfully distended bladder that can be palpated above the pubis on physical examination as a tense, dull, pear-shaped midline swelling arising out of the pelvis. Suprapubic compression causes an urge to urinate with lesser degrees of distension. By far the most common cause of acute retention in the elderly male is benign or malignant prostatic obstruction; occasionally a lower tract stricture is responsible. It is notable that the obstruction caused by benign prostatic enlargement is dynamic; the prostate can be easily traversed by a large instrument or catheter, it is just that the pressure flow dynamics between the bladder and outlet have progressed to the point where no urine will pass. Drugs often contribute to precipitating an episode of acute retention, particularly in elderly males. Alcohol, anticholinergic agents, sympathomimetic agents, beta-blockers and tricyclic antidepressants are the most common. Acute retention may also be
due to neurologic disorders such as multiple sclerosis or spinal injury or may be of psychogenic origin. In women, apart from neurogenic and psychogenic causes, the gravid uterus or fibroids or an ovarian cyst may cause retention by pressing on and obstructing the bladder. Postoperative retention is usually acute and follows operations on the abdomen, pelvis, perineum, anorectum, genitalia and inguinal region and is due to pain inhibiting relaxation of the external sphincter and contraction of abdominal muscles.

Chronic painless retention in elderly males, due to longstanding prostatic obstruction, may be associated with overflow incontinence and with renal injury.

**Diagnostic plan**

The assessment of acute retention is similar to that of the patient with LUTS. All patients should have their urine checked for infection (urine microscopy, culture and sensitivity) and this will often be done with placement of a catheter. Any urinary infection is treated. Tests of renal function with serum electrolytes and creatinine and urea should be done at initial assessment. PSA is not routinely performed, as the retention event will artificially elevate the result. It should be used only if there is an obvious extensive palpable cancer or suspicion of metastatic disease, which would usually markedly elevate the result.

**Treatment plan**

**Conservative treatment** should be tried first. The patient should be encouraged to void in privacy and in a warm environment and, if possible, is allowed to stand out of bed or use a toilet or a commode. Pain is relieved by opiate injection; running taps are also helpful. If these measures are unsuccessful, an anxiolytic agent, such as diazepam, and a warm bath may prevail. The addition of alpha-blockers, such as tamsulosin, in those patients with suspected bladder outflow obstruction due to BPH may be of use, especially in the setting of a trial of voiding (see below).

Conservative measures are of greatest help for those without a preceding history of bladder neck obstruction. In patients with a preceding history of poor stream, they are less likely to be successful, but still should be tried.

**Catheterisation** will be necessary for unrelieved retention. The catheter is left indwelling in those with a significant preceding obstructive history while their investigations proceed. In those without preceding problems, the catheter is removed after emptying the bladder (trial of voiding). If catheterisation is again required, the catheter is left indwelling pending investigation.

**Technique.** The technique of urethral catheterisation must minimise the risk of introducing infection in both sexes. Bacteria may come from the urethra and its environs and from the catheter contacting other unsterile objects. Breaches of asepsis are particularly liable to occur if the first attempt does not succeed and the catheter is inserted and removed several times with increasing frustration, impatience and discomfort affecting both operator and patient. Damage to the urethral mucous membrane is more likely in the male and other risk factors are a brusque and intemperate technique and the presence of urethral or prostatic pathology. Ensuring the catheter is in the bladder (flow of urine sited) prior to balloon inflation will prevent urethral injury.

Catheterisation is facilitated by adequate opiate analgesia and by initial lubrication of the urethra by an anaesthetic gel (1% lignocaine).

Using presterilised single-use catheters made of plastic, latex rubber or silicone rubber is now routine. Catheters, bougies and sounds are calibrated on the French (or Charrière) scale, which indicates external circumference in millimetres (so dividing by three gives the approximate external catheter diameter in millimetres).

The simplest catheter (Nélaton) is straight with a smooth round tip and subterminal side holes. The Tiemann catheter has a less flexible, curved olivary tip to aid in negotiating a urethra distorted by prostatic enlargement or stricture. These simple catheters are only used if the catheter is to be removed after relief of the retention (an ‘in/out’ catheter). For simple bladder evacuation a small (12F) Nélaton catheter is thus adequate as a first choice.

Further specialised types of catheters increase the range (e.g. the more exaggerated curves of the coudé and bicoëdé catheters) but are infrequently used. The curved introducer of the Foley catheter also mimics the curve of the posterior urethra and adds a degree of rigidity to the otherwise flexible catheter. Use of an introducer increases the risk of urethral damage and inadvertent false passage and should be restricted to those who have had the required training in their use. Finesse and gentleness must never give way to forceful impatience. If blood clots or other debris require drainage or aspiration, a wide-bore catheter (22 or 24F) that will tolerate suction without collapsing is required; for example, a whistle-tip catheter (with end and side holes) is suitable.

For patients with acute retention requiring continuing drainage, a balloon catheter, preferably made of silicone rubber, is desirable. The catheter should not be so large as to hinder free drainage of urethral
secretions and a 12F Foley catheter is satisfactory in an adult in most cases. If a Foley catheter cannot be passed, a thinner (6–8F) plastic Gibbon catheter may succeed in navigating a stricture, but often if stricture is present direct visualisation will be needed or suprapubic drainage. In the instance of a large prostate, it is often easier to pass a larger size 16 or 18F catheter with a little more inherent rigidity than a smaller catheter. It will more easily pass through the curve of the bulbar urethra without coiling up than might a smaller bore catheter. If urethral catheterisation for urinary retention is unsuccessful, the distended bladder can be drained suprapublically by percutaneous insertion of a balloon suprarenal catheter. Again, an experienced operator is required and kits based on Seldinger techniques now exist to ensure safe suprapubic puncture without traversing other organs or vessels. Any patient who has had a prior laparotomy or has a lower midline abdominal incision should have a preplacement ultrasound to mark the site of safe puncture (Fig 9.9).

**Acute retention due to prostatic obstruction**
and with pre-existing symptoms of bladder outlet obstruction is an indication for prostatectomy. After passage of a silicone-rubber urethral catheter and connection to a closed drainage system, preoperative tests and preparation are performed.

**9.7 URINARY INCONTINENCE**
Urinary incontinence (involuntary loss of urine) is a particularly distressing symptom. In women, it most commonly relates to the stresses of parturition and the ageing process and in men, to partial bladder neck obstruction, but many other causes, including infections, operative injuries, neurologic bladder lesions and bladder contracture after radiation, exist. Functionally, incontinence may relate to bladder neck and sphincter problems or to problems of the detrusor mechanism. The assessment of urinary incontinence often overlaps with that of LUTS, as the two may coexist. Nocturnal enuresis (loss of urine occurring during sleep) may be considered a subtype of incontinence but is usually dealt with as a specific isolated symptom when it occurs (monosymptomatic nocturnal enuresis).

**Types of urinary incontinence**
1. Stress incontinence (urethral hypermobility, intrinsic sphincter deficiency)
2. Urge incontinence (detrusor overactivity)
3. Continuous or total incontinence

**Clinical features**
These vary with the cause and may also commonly overlap.

1. **Stress incontinence**
Urethral incontinence of small volumes occurs with coughing, sneezing, straining and laughing. Nocturnal frequency and incontinence do not usually occur.

Stress incontinence is very common in women. The normal competence of the female urethra depends on:
- the supports of the bladder neck and urethra maintaining the position of the proximal urethra above the pelvic floor
- the competence of the urethral sphincter, which is situated at about the mid-urethral level.

Parturition predisposes to weakening and stretching of the sphincter and to urethral descent (hypermobility). Cysto-urethral descent can be observed clinically, by cystography or on ultrasound. Urodynamic studies can measure sphincter competence. Elevation of the urethra (by intravaginal pressure) may be observed clinically to control incontinence.

The sphincteric tone can be inhibited by alpha-antagonists (prazosin), by angiotensin converting enzyme inhibitors and by a number of other agents that may contribute to stress incontinence. Oestrogen status also affects urethral competence and postmenopausal oestrogen lack may contribute to incontinence.

2. **Urge incontinence**
Patients with urge incontinence have frequency of micturition by day and night, cannot put off the desire to void and may be incontinent on the way to the toilet, often with large volume losses. Factors
causing local irritation or stimulation of the detrusor muscle, such as urinary infections, stones, tumours, neurological lesions and the urethral syndrome, must be identified, but in many cases the cause is idiopathic detrusor overactivity. Detrusor overactivity (which is an urodynamic diagnosis) or OAB can lead to LUTS or incontinence (OAB wet). Other factors contributing to overactivity or low compliance of the bladder are a small capacity bladder, due to irradiation or chronic infection. Detrusor overactivity may also be caused by neurological disease and a history should be sought in all cases of urge incontinence. Careful neurological assessment to exclude neuropathies includes testing for perineal sensation, anal sphincter tone and for scrotal and anal reflexes.

It is common for patients, especially females, to present with mixed incontinence, that is, a mixture of urge and stress-related symptoms or the complaint of involuntary loss of urine associated with urgency and also with effort or physical exertion. Where conservative measures fail in these cases, urodynamics may assist in diagnosis (see next page).

### 3. Continuous or total incontinence

In continuous incontinence, dribbling of small amounts occurs at all times. It is clearly important to exclude neurogenic and anatomic causes or that overflow is occurring, as described below. Ectopic ureters or urinary fistulas may cause extra-urethral incontinence. Overflow incontinence causes continual dribbling also, but the bladder is constantly full. Organic bladder neck obstruction from prostatic disease or neurogenic causes are usually responsible. Inability to prevent post-micturition dribbling accompanies prostatic obstruction in elderly males. In females, neuropathies, detrusor abnormalities causing a hypocontractile or atonic bladder and drugs with anticholinergic effect are other likely causes.

Bladder distension with overflow incontinence is identified by physical examination and by checking for residual urine. Over 100 mL is significant in adults but a single measure of a residual in this vicinity is not diagnostic of voiding dysfunction. The pattern of residuals over time is more important and their relationship to the voided volume should be observed. Patients who are asked to present for assessment with a full bladder may be over distended and will record a residual on voiding.

### Treatment plan

Irritative conditions (especially infections) must be diagnosed and treated and anatomic abnormalities causing extra-urethral incontinence identified.

Treatment is then primarily aimed at correcting urethral hypermobility or intrinsic sphincter deficiency causing stress incontinence or the OAB. Overlap of the two conditions is common and characterisation of the cause can be helped in difficult instances by urodynamic studies, which are used to demonstrate objective abnormalities. Bladder pressures and flow rate recordings can be combined with radiographic imaging (video or fluoroscopic urodynamics). Parameters measured include flow rate, residual urine, bladder volume, compliance, and voiding pressures and imaging during voiding.

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*Figure 9.10a* Fascial sling for stress incontinence

Based on Cardozo & Staskin, 2006

*Figure 9.10b* A retropubic tape such as a TVT and a transobturator tape through the same pelvic bones

From Reiffenstuhl, 1996
1. Stress incontinence
Conservative treatment includes pelvic floor exercises, perhaps with biofeedback, correction of obesity and constipation, cessation of aggravating medications, fluid management and oestrogen replacement.

Over 100 operations have been described to correct stress incontinence. Most aim to buttress and support the tissues surrounding the bladder neck and to draw the urethra upwards behind the pubis. Abdominal or vaginal approaches can be used to achieve these aims. The most common procedures now rely on the passage of synthetic, autologous or biomaterial slings or tapes around the mid or proximal urethra and into either the retropubic space or via the obturator canal (Figs 9.10a and b). Retropubic (Burch) colposuspension is another option that can be performed either open or laparoscopically for the treatment of incontinence.

2. Urge incontinence
Elimination of obvious causes of irritation, neuropathy (such as upper motor neurone lesion) and obstruction, as well as urodynamic studies with cystometry, will identify by exclusion a group in whom no clearly defined abnormality can be detected and who are classified as having idiopathic detrusor instability. Anticholinergic drugs (oxybutinin, tolterodine, solifenacin, darafenacin) may help, together with bladder drill. Newer approaches include the injection of intradetrusor botulinum toxin, which has reduced the need for more complex surgical procedures, including augmentation cystoplasty (incorporation of a patch of bowel onto the bladder dome).

Management of complex cases of incontinence
Urinary diversion, most commonly in the form of ileal conduit formation where the ureters are anastomosed to the proximal end of a segment of ileum the distal end of which is brought to the surface as a stoma, does not cure urinary incontinence but merely substitutes for it. The tissues surrounding the bladder neck and to draw the urethra upwards behind the pubis. Abdominal or vaginal approaches can be used to achieve these aims. The most common procedures now rely on the passage of synthetic, autologous or biomaterial slings or tapes around the mid or proximal urethra and into either the retropubic space or via the obturator canal (Figs 9.10a and b). Retropubic (Burch) colposuspension is another option that can be performed either open or laparoscopically for the treatment of incontinence.

Sphincter replacement. When urinary incontinence results from permanent damage to the sphincter mechanism (e.g. in lower motor neuron lesions such as spina bifida or postoperatively after radical prostatectomy), urinary continence can be restored in both sexes by the implantation of artificial sphincters. These involve a silicone cuff surrounding the urethra connected to a reservoir and a small pressure pump that inflates the cuff and is buried suprapubically or in the scrotum or labium. A suitably placed valve is also buried and pressure on this allows the cuff to deflate and voiding to occur.

Chronic painless retention with overflow incontinence is treated by transurethral prostatectomy. These patients are at greater risk of perioperative renal failure.

9.8 PENILE LESIONS
The penis has urinary and sexual functions. Disorders can be grouped anatomically and functionally.

Common causes
1. Disorders affecting the foreskin
2. Disorders affecting the urethral meatus
3. Disorders affecting the glans
4. Disorders affecting the shaft
5. Sexual and functional disorders
6. Sexually transmitted infections

Clinical assessment and diagnostic tests
1. Disorders affecting the foreskin
Phimosis is stenosis of the preputial orifice, preventing its free retraction over the glans. The foreskin is usually nonretractile over the first few months of life. Congenital soft adhesions between the prepuce and glans are normal for several months after birth; they normally separate by six to 18 months of age, allowing retraction of the foreskin over the glans. By one year more than 50% will retract. Occasionally, congenital phimosis persists, with ballooning of urine beneath the prepuce on micturition. More commonly phimosis is due to fibrosis following infection or trauma in the adult. Recurrent infection of the glans and preputial sac (balanoposthitis) is both a cause and a common complication of phimosis. Most such infections are nonspecific and associated with poor hygiene; diabetes can be a factor. The prepuce must be retracted to perform an adequate clinical examination of the glans; occasionally a carcinoma of the glans or an infective ulcer of venereal origin is revealed as the cause of phimosis.

Paraphimosis is inability to replace the prepuce over the glans after its retraction, due to a constricting ring behind the glans. Paraphimosis is a potential danger of forcible retraction of a phimosed prepuce. Paraphimosis is a specific danger after urethral catheterisation if the foreskin is left retracted after catheter insertion. Continuing paraphimosis leads to oedema and congestion of the glans, creating a vicious cycle. On examination the glans is swollen and oedematous. A deep groove is seen just proximal to the glans, created
by the tight meatal skin. This constricting band may spontaneously split, ulcerate and weep.

Traumatic ulcer may be slow to heal and resemble a venereal ulcer. Circumcision may be necessary if chronic infection becomes established.

2. Disorders affecting the urethral meatus
The normal external meatus is a sagittal slit and is normally the narrowest point of the urethra. The urethra immediately proximal to the orifice is dilated, causing rotational streaming and focusing of the issuing urinary stream.

Hypospadias is malpositioning of the urethral orifice on the underside of the penis. Congenital hypospadias may be glanular (most common), coronal, penile or perineal. An associated fibrous band between the orifice and the normal position of the urethral meatus is often present and may cause bowing of the penile shaft (chordee).

Epispadias, the reverse disorder, is much less common and is usually associated with gross defects of fusion of the anterior bladder and urethra and of the pelvic girdle (extroversion).

Meatal strictures may be congenital or acquired. A meatal ulcer is a common problem in infancy and is virtually confined to circumcised infants. Meatal strictures can follow ammoniacal dermatitis (nappy rash) in babies. Any urethral discharge should be noted, its character observed and a bacteriologic swab taken for smear and culture.

3. Disorders affecting the glans
Discharge from the prepuce with inflammatory skin changes suggests an underlying disorder. The glans is examined after gently retracting the prepuce fully. Balanitis and balanoposthitis are often nonspecific but may be due to a number of specific venereal infections or secondary to malignant or premalignant conditions. Ulcers of the penis are most commonly found on the glans. It is advisable that a penile ulcer be considered infective and gloves should be worn when examining the prepuce or shaft.

Carcinoma of the penis usually starts as a nodular warty growth on the glans near the coronal sulcus or on the inner aspect of the prepuce. The lesion may initially resemble a venereal wart. Progressive growth causes a purulent or bloodstained discharge and the lesion has the typical characteristics of a squamous cell carcinoma with elevation, induration and fungative ulceration. Associated lymphadenopathy may be infective or neoplastic. Carcinoma is usually seen in elderly patients with poor hygiene.

4. Disorders affecting the shaft
Sebaceous (epidermoid) cysts are most common in the scrotal skin but may occur on the penis. Subcutaneous induration of the shaft with a firm, nontender plaque of fibrous tissue in the fascia surrounding the corpus cavernosum on one or both sides is due to Peyronie's disease, a condition of unknown cause akin to Dupuytren's disease and which results in irreversible damage of the tunica albuginea of the corpora cavernosa. Peyronie's disease is one of the causes of chordee during erection (Fig 9.11). The natural history of the disease is an active and painful phase of plaque development and then a quiescent phase. The active phase is treated symptomatically and no further treatment of the quiescent phase is required unless chordee that limits voiding in the upright position or sexual penetration results from the plaque.

5. Sexual and functional disorders
Impotence is a common problem and is defined as failure to obtain or maintain an erection strong enough for satisfactory sexual activity. Organic causes can be grouped by aetiology and are most commonly: vascular, associated with and having the same risk factors as generalised vascular disease; traumatic, particularly to the pelvic nerves and vasculature (including surgery for prostate cancer); neurogenic, including spinal cord injury and multiple sclerosis; endocrine, including diabetes, where the autonomic neuropathy and vascular insufficiency result in loss of erections; any debilitating disease (anaemia, carcinoma); and old age. Many drugs are thought to be contributory (alcohol, opiates, hypotensives, phenothiazines and sedatives), although the association is often poorly understood. Functional causes associated with psychogenic factors are not as common and, as a primary cause, are diagnoses of exclusion once organic causes have been excluded.

Priapism is a prolonged erection of greater than six hours and is a urological emergency. It can be considered as high flow (arterial) or low flow (venous)
in cause. Low-flow priapism occurs where there is venous stasis that can be due to multiple causes, including persistent spasm of the venous smooth muscle sphincters that maintain erection, after use of intracavernosal injection for impotence, conditions causing hypercoaguable states such as sickle cell anaemia, multiple myeloma or leukaemia, other malignancy and other drugs including anticoagulants, phenothiazine, fluoxzetine and cocaine. High-flow priapism results from an arteriovenous anomaly after pelvic, perineal or penile trauma and unlike low-flow, is generally not painful early on. If prolonged, priapism of either cause will lead to thrombosis of the veins draining erectile tissue. Subsequently, even though priapism is relieved, there may be permanent impotence. The corpora cavernosa are stiff and distended and painful, the corpus spongiosum and glans are flaccid.

Impaction of foreign bodies and lacerations are usually due to measures aimed at maintaining or inducing erection or to unusual forms of sexual behaviour (fetishism).

Haemospermia can occur with urinary infections or epididymo-orchitis or occasionally as an isolated event. Thorough urological work-up and investigation as for haematuria, with the addition of a transrectal ultrasound and semen analysis, are performed; about half of the cases are found to be idiopathic.

6. Sexually transmitted infections

The management of sexually transmitted infections (STIs) requires up-to-date knowledge of diagnostic and treatment practices, awareness of contact tracing and compassionate non-judgemental care. An increasing number of patients with STIs have human immunodeficiency virus (HIV) infection, with either overt disease or positive antibody titre. All patients who present with a suspected STI should be screened for HIV and hepatitis B and C.

Syphilitic (Hunterian) chancre. As a general rule it should be assumed that an ulcer on the glans penis is a syphilitic ulcer until proved otherwise. Care to prevent cross-infection should be taken. The ulcer takes about four weeks to appear from the time of contact. The chancre is usually painless. The lesion first appears as a firm reddened macule, usually in the coronal sulcus which, in most cases, undergoes ulceration and eventually regresses. The inguinal lymph nodes are invariably enlarged and are firm, discrete and mobile. Patients are not toxic at the time of penile ulceration but become so during the secondary stage of the disease (about six to eight weeks after the appearance of the penile lesion). The causal organism, Treponema pallidum, is recognised by dark-field examination of exudate obtained from the lesion. The diagnosis may also be made by positive serology. Pain during micturition with a purulent discharge is commonly due to gonococcal urethritis. The causative organism is Neisseria gonorrhoea. Infection often also involves the epididymis, seminal vesicles, prostate and bladder. Urethral stricture is a late complication.

Ulcration, particularly if painful, may be due to herpes simplex infection. This viral infection starts as a patch of erythema on the inner surface of the prepuce or on the glans, which develops vesicles and pustules that, on abrasion, form small ulcers. The diagnosis is made cytologically by finding the characteristic ‘ground glass’ inclusion in giant cells from the involved epithelium. The common venereal viral warts (condylomata acuminata) occasionally ulcerate. Rare causes of ulceration include chancroid (soft chancre). Chancroid is an acute ulcerative lesion with lymphadenopathy caused by Haemophilus ducrey. Other diseases diagnosed by smear and culture are lymphogranuloma venereum (Chlamydia) and granuloma inguinale (Donovan bacillus). These infections are commoner in tropical countries. Penile candidiasis presents as an itchy balanitis with white plaques. All these forms of ulceration are common in patients with HIV infection.

Treatment plan

Phimosis and chronic balanitis are treated by circumcision. Paraphimosis should be reduced with the aid of analgesia and sedation, if possible; if necessary, a dorsal slit is made in the constricting band. Circumcision is usually necessary for permanent relief.

The treatment of carcinoma is by amputation or local excision with a 2 cm margin. Inguinal gland
management is usually delayed because of the frequency of infection within the nodes. In many cases the nodes disappear with control of infection. Later excision of inguinal nodes is essential if they are involved. The decision to explore and excise impalpable lymph nodes is based on the assessment of the overall risk of the disease as determined by the clinical stage, histological grade and the presence of vascular invasion on histology.

Management of impotence has been revolutionised by the development of phosphodiesterase type 5 (PDE5) enzyme inhibitors. These drugs act in the breakdown of cyclic guanosine monophosphate (cGMP), which causes smooth muscle relaxation in the arterioles of the corpora cavernosa, hence increasing intracavernosal blood flow and invoking erection. These drugs (sildenafil, tadalafil and vardenafil) can be taken by most patients, except where there is concomitant nitrate use for the management of angina. There is a small incidence of minor side effects such as headache and facial flushing.

Initial management of impotence therefore should take place in the general practice or primary care setting where, after careful history and examination to exclude organic pathologies that should be otherwise treated, a trial of PDE5 inhibitors may take place.

Local intracavernosal injections of a vasodilator, such as alprostadil or a papaverine-based mixture, can be used in patients who do not respond to PDE5 drugs. Long-term compliance with this treatment is poor.

Implanting an inflatable penile prosthetic device, which have high satisfaction and efficacy rates, are suitable for men who want a long-term ‘cure’ of their erectile dysfunction.

In about a quarter of cases of priapism there is an associated malignancy. If initial treatment with cold showers and oral pseudoephedrine fails then intracavernosal washout with saline followed by a dilute solution of phenylephrine with cardiac monitoring should be attempted. If these measures fail, then a shunt between one of the corpora cavernosa and the corpus spongiosum or between corpus cavernosum and saphenous vein should be carried out within six hours. Impotence is a common sequel of persistent priapism.

Sexually transmitted infections usually respond to antibiotics. Syphilis and gonorrhoea are treated with penicillin. Azithromycin 1 g orally in a single dose or doxycycline 100 mg orally two times a day for seven days is the treatment of choice for nongonococcal urethritis in men or other infection with Chlamydia trachomatis. Uncomplicated gonococcal infections are treated with ceftriaxone. Herpes genitalis is treated with acyclovir and the modern antiretroviral medications have greatly improved the prognosis of HIV infection, but this should not impact on the judicious use of condoms and needle exchange to prevent spread of the disease. Chancroid is treated with sulfonamides, granuloma venereum and inguinale with tetracycline and venereal warts are treated by local diathermy excision. Treatment of the patient’s partner is important in preventing recurrence.

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