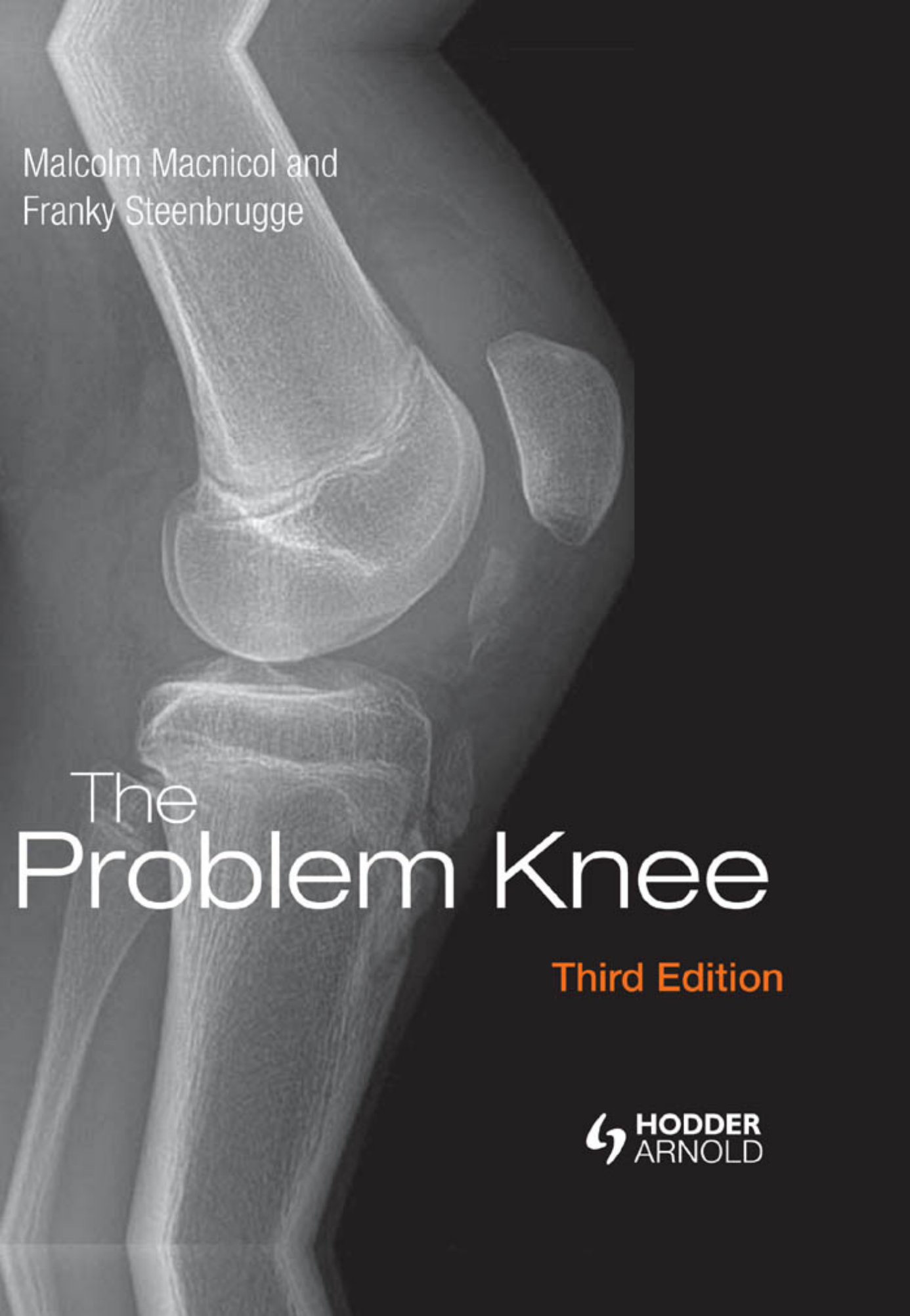


Malcolm Macnicol and
Franky Steenbrugge

The Problem Knee

Third Edition

HODDER ARNOLD

The Problem Knee

This page intentionally left blank

Malcolm Macnicol
MBChB, BSc (Hons), MCh, FRCS, FRCSEd (Orth), FRCP, Dip Sports Med

Previously Consultant Orthopaedic Surgeon and Senior Orthopaedic Lecturer, Royal Hospital for Sick Children, Royal Infirmary and Murrayfield Hospital, Edinburgh, UK

and Franky Steenbrugge
MD, PhD, MChOrth, FRCSEd

Professor in Orthopaedics, Department of Orthopaedic Surgery and Traumatology, Ghent University Hospital, University of Ghent, Belgium; Co-founder of the Belgium Knee Society

The Problem Knee

Diagnosis and management in the younger patient

3rd Edition

HODDER ARNOLD
AN HACHETTE UK COMPANY

First published in Great Britain in 1986 by Butterworth Heinemann
Second edition 1995

This third edition published in 2012 by
Hodder Arnold, an imprint of Hodder Education,
a division of Hachette UK
338 Euston Road, London NW1 3BH

http://www.hodderarnold.com

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

ISBN-13 978-1-444-12011-0

1 2 3 4 5 6 7 8 9 10

Commissioning Editor:	Francesca Naish
Project Editor:	Joanna Silman
Production Controller:	Joanna Walker
Cover Design:	Julie Joubinaux
Indexer:	Laurence Errington

Typeset in 10.5/12 pt Goudy Old Style Regular by Datapage
Printed and bound in Italy by Printer Trento

Contents

This page intentionally left blank

Preface

The knee is a complex and crucial joint, vulnerable in the daily round as well as during sports and in transport or industrial accidents. While the causes of acute or chronic knee symptoms are not always apparent, it is to be hoped that, at very least, an informed questioning and examination of the patient or injured athlete will ensure that needless morbidity is avoided. Whether the sometimes inextricable mix of reactive synovitis, soft tissue and osteochondral damage can be teased apart may eventually depend on the experience and investigative skills of the surgeon; but assuredly a lack of cooperation and free communication with colleagues in other disciplines will retard both the speed and success of treatment.

This monograph emphasizes the basic principles in managing a 'problem knee' in the younger patient. The interrelationship between skeletal and soft tissues injuries is acknowledged, but in the interests of a simplified and rational approach, separate chapters deal with the different components of the joint, albeit with some repetition. Details about most surgical approaches have been kept to a minimum because these can be learnt effectively only in the operating theatre. Scanning the knee with magnetic resonance imaging, ultrasound or computed tomography has augmented the clinical value of history taking, careful and standardized physical examination, and conventional radiography. However, the unconditional and excessive use of investigations of this sort cannot be condoned. Clinical assessment is still the bedrock of management.

Operative intervention for patellar pain, with or without maltracking, is less frequently advised than in the past. The subtleties of patellar instability make surgical procedures prone to patient disappointment. Cruciate ligament reconstruction, on the other hand, is now a relatively safe and satisfactory procedure, particularly for the acute anterior cruciate rupture. The benefits of this intervention are now convincing, not least the protection of other structures in the knee that has been stabilized. Meniscal repair and (osteo)chondral grafting are appropriate in selected cases, and after all forms of surgery a more rapid rehabilitation is espoused.

The text now incorporates recent advances in surgical management and newer concepts in conservative treatment. As before, systemic conditions are described as they relate to the knee in younger patients but degenerative disease is excluded. An overview of fracture care is presented without elaboration.

The first edition of *The Problem Knee* appealed especially to physiotherapists, family doctors and casualty officers. The second edition broadened its appeal to surgical trainees and those in orthopaedic practice. With the welcome assistance of Professor Franky Steenbrugge, who has extensively revised Chapters 5 and 6, it is hoped that this third edition will prove of further value. Chapter 4 on paediatric conditions has also been modernized.

This page intentionally left blank

Acknowledgements

The authors thank Ian Beggs, Michael Devlin, Alison Green, Robb Kidd and Morag Lunn for their contributions to the third edition.

We dedicate the book to our wives and children.

This page intentionally left blank

1

The mechanism and presentation of injuries to the knee

Introduction

The knee joint is designed for rapid and complex movements, often when encumbered by the weight of the body. These two requirements, speed and strength, place stresses upon the knee structures, which may in turn produce symptoms. Another characteristic is the exposed position of the knee, which makes it vulnerable in many occupations and sports. The combination of this vulnerability to trauma and its underlying sophistication must be kept in mind not simply when identifying the mechanism of injury but also when planning a return to normal activities and to the repetitive demands of sport.

There are four principal groups who may present with symptoms:

- Those who are relatively unfit and in whom a mild congenital weakness may make the knee slightly unstable and subsequently troublesome
- Athletic individuals who subject their knees to repeated stresses and significant loading, with subsequent fatigue not only of the soft tissues but of the skeleton and surfaces of the joint
- Otherwise normal individuals whose knees are subjected to a sudden, high-velocity collision or fall, which exceeds the strength of the components of the knee, for example, those involved in motorcycle accidents
- Those in whom injuries seem inextricably and frustratingly linked with a personality disorder or neurosis.

The knee joint is supported by its capsule, the ligaments and surrounding muscles, with assistance from the menisci and the patellofemoral joint. The configuration of the femoral and tibial articular surfaces is principally concerned with weightbearing, since the relatively unconstrained hinging and gliding that occurs between them is designed for speed of movement. That temperamental sesamoid – the patella – improves the efficiency of the quadriceps muscle group and hence the strength of extension and anti-gravity control. The biological trade-off between mobility and stability is largely governed by the proprioceptive loop formed by the sensors in the ligaments and their companion muscles (Figure 1.1). A break in this protective arc affects function and long-term recovery. The balance between stability and free movement is easily upset.

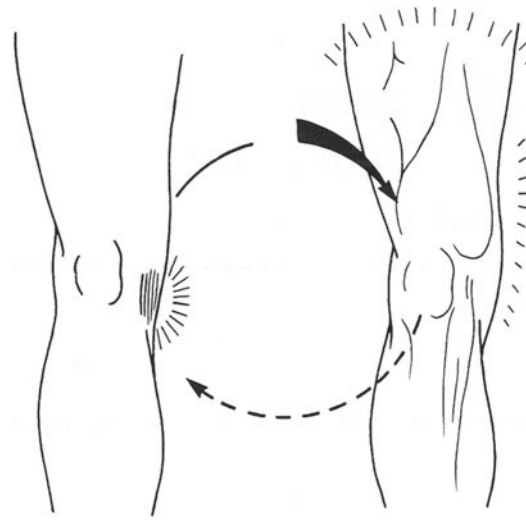


Figure 1.1 A protective reflex arc links the ligaments and muscles of the knee; when a ligament, such as the medial collateral, is stretched, impulses are referred by the afferent nerves to the spinal cord. Efferent nerves then transmit the signal to the muscles, which contract appropriately, thus enhancing the stability of the knee. Proprioception is also afforded by other structures in the knee (see Table 5.1, p. 96).

History

Obtaining a clear history of the events leading up to an injury of the knee may be difficult but is of importance. A careful questioning about the onset of the problem leads the clinician to examine and investigate the knee more accurately. Contributory spinal, hip and other pathologies are more likely to be exposed. It also allows an assessment of the personality and reaction of the patient to the mishap. Unfortunately, the memory of acute events is often blurred by the speed of the accident or by the time that has elapsed following a more chronic complaint. On rare occasions the patient may conceal the nature of an injury or its circumstances if litigation or intentional concealment colour the event.

Since the knee can be stressed in any direction, the mechanism of injury may include valgus or varus angulation, excessive flexion or extension, and extremes of internal or external rotation, often in combination. Forced anterior or posterior movement of the tibia in relation to the femur, and axially directed stresses may damage both bone and soft tissue. Malfunction of the patellofemoral mechanism may confuse matters further and may persist after the original injury has resolved.

Anatomy

Understanding the surface anatomy of the knee is essential if the extent of the structural damage or pathological process is to be assessed accurately. Certain landmarks of surface anatomy are relatively prominent and thus palpable: the condyles and joint lines, patellar outline, tibial tuberosity and Gerdy's tubercle, and the fibular head (Figure 1.2). The extent of the suprapatellar pouch, dimensions of the patellar tendon, trailing edge of the iliotibial band, collateral ligament attachments and popliteal structures are identifiable. Further details about the anatomy of the patellofemoral mechanism, the ligaments and the menisci are given in Chapters 4–7.

The cutaneous nerves are important to appreciate and are relatively constant (Figure 1.3). Surgical incisions and percutaneous procedures may endanger these nerves, most commonly the infrapatellar branch of the saphenous and the sural. Troublesome numbness and

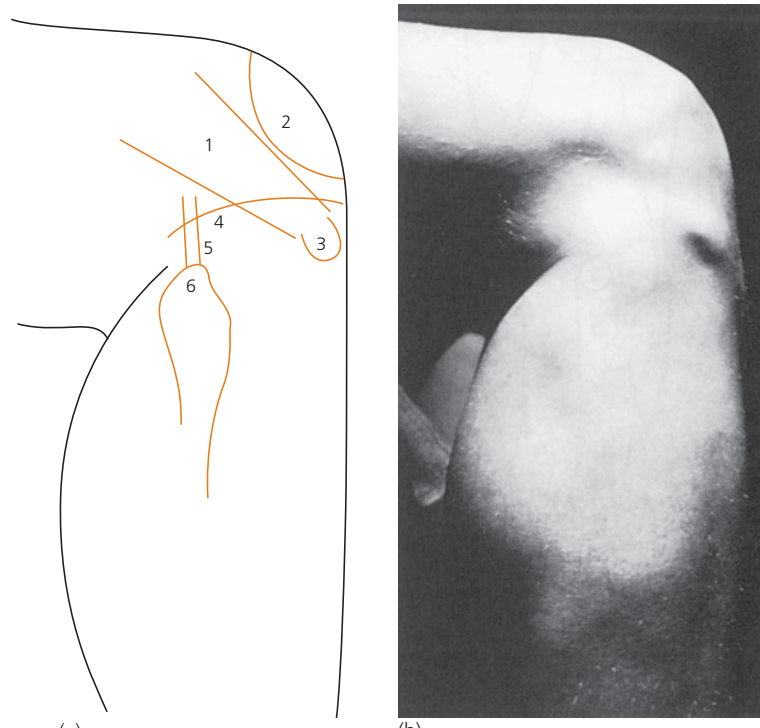


Figure 1.2a,b Surface anatomy of the lateral side of the knee: 1, iliotibial band; 2, patella; 3, Gerdy's tubercle, where part of the band inserts into the tibia; 4, lateral joint line (defining the peripheral rim of the lateral meniscus); 5, lateral (fibular) collateral ligament; 6, fibular head.

dysaesthesia in the affected nerve distribution may cause significant complaints from those affected.

Medial side of the knee

Figures 1.4 and 1.5 show the structures that overlie the medial side of the knee. These may be injured in sequential fashion by a valgus force applied to the leg, including the medial collateral ligament, the medial capsule and its important posteromedial corner, the medial meniscus and the anterior cruciate ligament. Greater disruption produces subluxation and dislocation of the joint, with tearing of more distant structures such as the medial patellar retinaculum, the posterior cruciate ligament and capsule, and possibly the lateral compartment components.

Rotational stresses combined with valgus force produce different patterns of disruption. Some structures will tear completely whereas others will remain 'in continuity' but weakened. Fractures of the joint surfaces or avulsion of ligament attachments to the skeleton are seen in the child (Chapter 4) because the strength of cancellous bone is less than that of connective tissue.

Lateral side of the knee

A similar cascade of injuries may occur when a varus force is applied to the knee. The damaged structures include the fibular (lateral) collateral ligament, the lateral capsule and arcuate complex posteriorly, the lateral meniscus, the cruciate ligaments, the iliotibial band, the biceps tendon and peroneal nerve and the popliteus tendon (Figures 1.6, 1.7, p. 6). Compressive lesions in the medial compartment may coexist, including bone bruising and osteochondral fractures, and medial meniscus lesions. Anatomical structures in the thigh and calf (Figures 1.7–1.9, pp. 6–7) may also be injured.

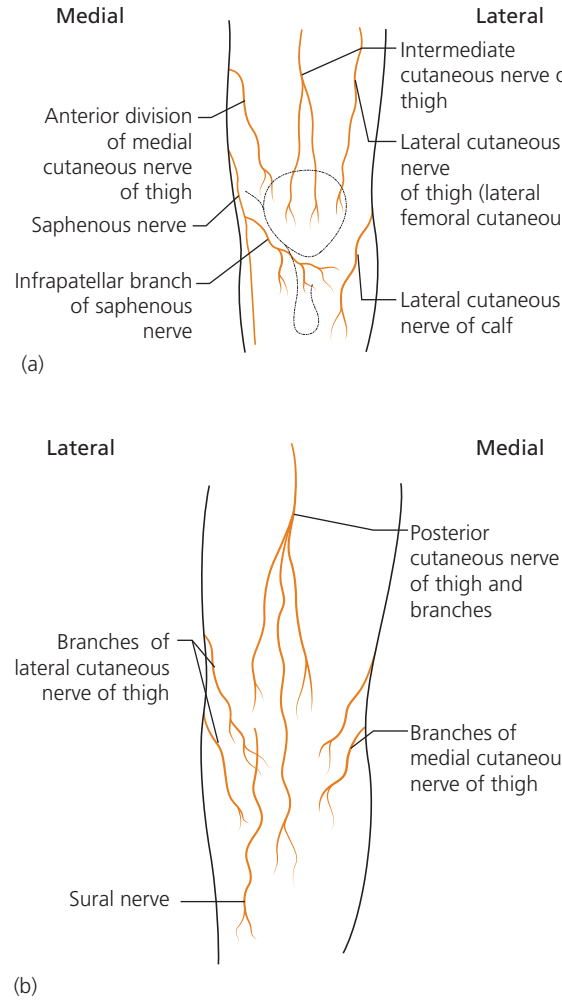


Figure 1.3 The distribution of the cutaneous nerves of the lower limb with relevance to the knee: (a) anterior knee; and (b) posterior knee.

Clinical presentation

When taking a history, specific questions should be asked about:

- pain
- loss of normal movement
- locking
- swelling
- abnormal mobility (instability).
- personality
- age-related symptoms

Pain

Pain is not often well localized (Figure 1.10, p. 8), although associated tenderness tends to be. However, secondary but mild injuries to other structures may even make the relevance of the apparently focal tenderness uncertain, such as patellar subluxation producing pain

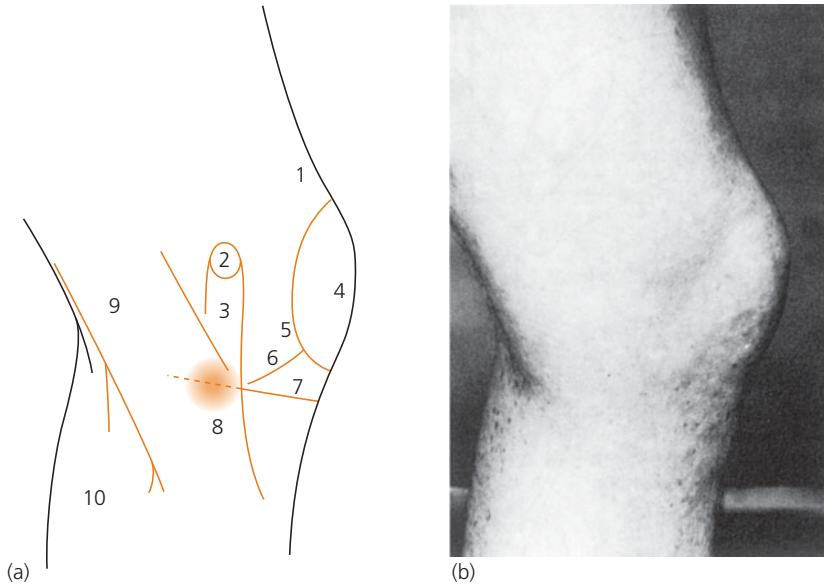
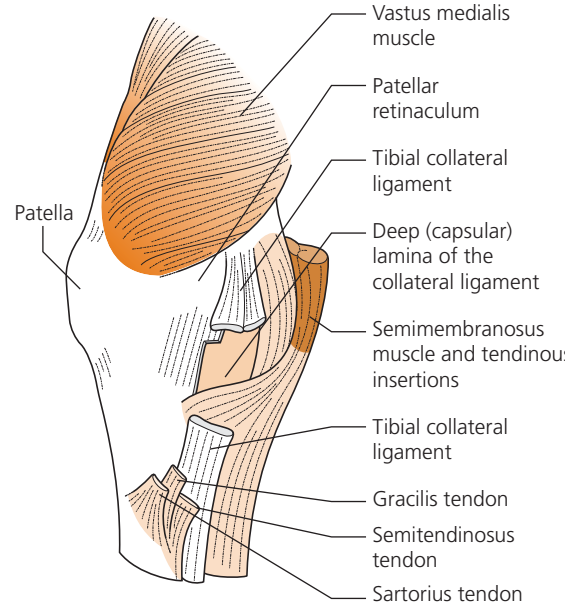


Figure 1.4a,b Surface anatomy of the medial side of the knee: 1, suprapatellar pouch; 2, adductor tubercle; 3, medial (tibial) collateral ligament; 4, patella; 5, parapatellar synovium; 6, anterior edge of the medial femoral condyle; 7, medial joint line (defining the peripheral rim of the medial meniscus); 8, 'no man's land' where the medial ligament and medial meniscus overlap; 9, the 'pes anserinus' (sartorius, gracilis and semitendinosus tendons); 10, semimembranosus and medial head of the gastrocnemius muscles.

Figure 1.5 Soft tissue anatomy of the medial side of the knee.



and tenderness over the medial side of the knee, suggesting medial ligamentous or meniscal damage; or tears in one meniscus referring symptoms, and even signs, to the contralateral compartment of the knee. Despite these difficulties, it is important to describe pain as precisely as possible, noting site, periodicity, precipitating factors and any referral of the symptom.

Figure 1.6 Soft tissue anatomy of the lateral side of the knee.

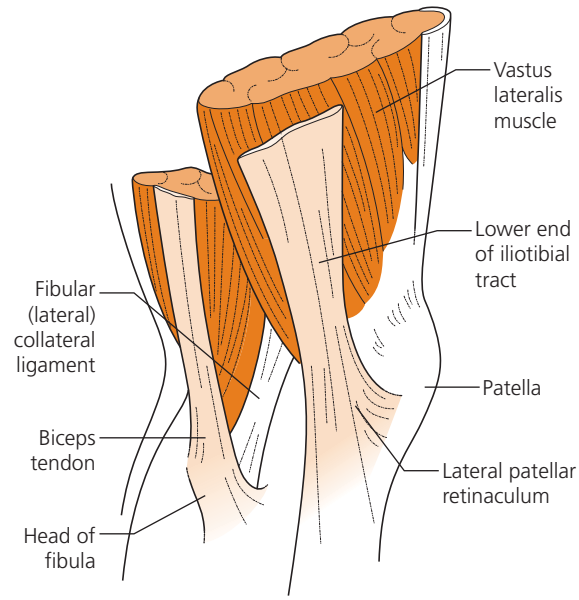
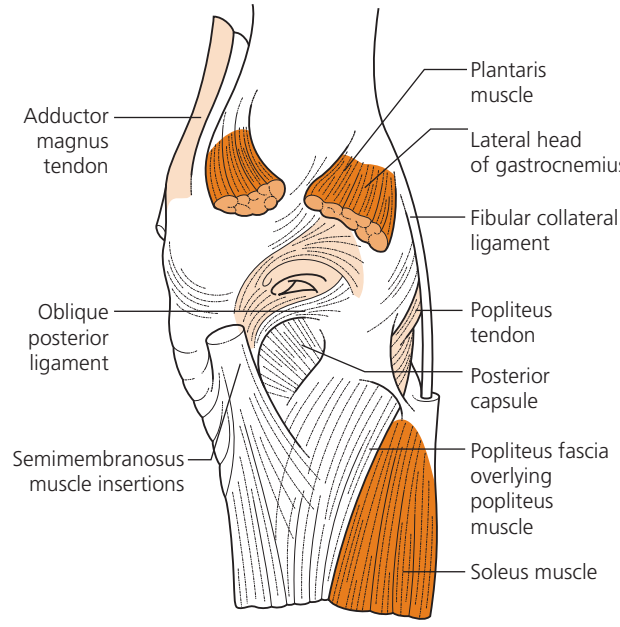


Figure 1.7 Soft tissue anatomy of the posterior surface of the knee.



Loss of normal movement

Loss of normal movement is usually described by the patient as a feeling of stiffness, or as a 'block' to the full range of knee extension or flexion. Both these forms of restriction may be painful, accompanied by a limp or alteration in gait pattern. Rotation of the tibia below the femur is also reduced.

Stiffness indicates that the periphery and possibly also the articular cartilage surfaces are abnormal. This increased resistance to movement throughout the range of flexion is characteristic of an inflammatory condition, with or without the presence of an effusion. A more unyielding form of stiffness develops in time, particularly if muscle and soft tissue

contractures occur, or if the osteoarthritic process alters the articular surfaces markedly and reduces the compliance of soft tissues.

Locking

True locking may be intermittent or persistent. A relatively painless block to extension, or flexion deformity, and the loss of flexion resulting from chronic arthritis should be distinguished from the springy and often exquisitely painful block produced by a torn meniscus or loose body. Locking may also be produced by an impinging anterior cruciate ligament stump or synovial impingement, especially if affected by an inflammatory process or neoplasm.

The circumstances that cause the knee to feel restricted or locked should be identified. A synovitis will cause the knee to stiffen after a night's sleep or after prolonged sitting. Locking tends to be noticed during activity more than at rest, although it may be accompanied by a sense of restriction when the knee has been kept in flexion, during crouching or sitting. Certain unguarded movements, particularly twisting on the flexed knee, are not only potent causes of meniscal tears but also produce further episodes of locking and increased displacement of the tear (Figure 1.11).

Trillat (1962) described the progression of a vertical tear which may either proceed through the central portion of the meniscus, forming a 'bucket handle', or may rupture through the posterior horn, producing a flap. The bucket handle may tear across centrally, resulting in various sizes of anterior and posterior flaps, or may rupture through the anterior horn. Locking may then become intermittent or cease, although the patient may feel something intermittently moving within the knee or protruding at the joint line. Dandy (1990) also described his experience with different meniscal tears, and offered an alternative classification, although the nature of the lesions is basically the same.

The presence of a pathological meniscus usually causes some loss of passive movement, even in the chronic stages. However, peripheral tears in the vascular zone may heal with time, if stable, and smaller flaps and tags may be thinned out to the extent that they cease to trouble the patient. The horizontal cleavage lesion, and certain oblique degenerative tears, may also become asymptomatic (Noble and Hamblen 1975; Noble and Erat 1980). It can be surprising to encounter the occasional case of a displaced bucket handle tear in a

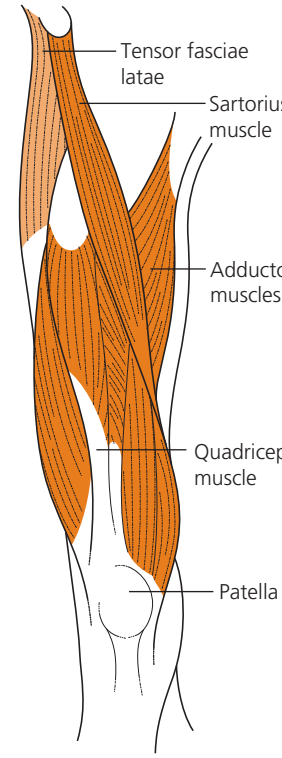


Figure 1.8 The anterior thigh muscles.

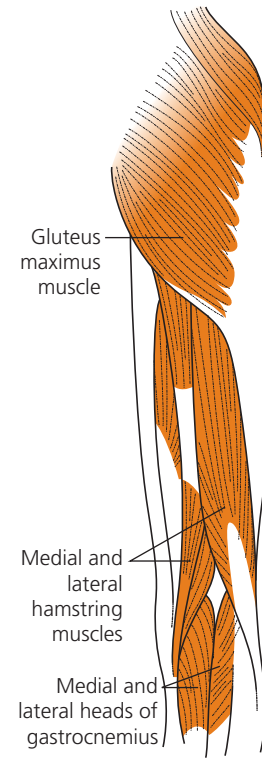


Figure 1.9 The posterior thigh and superficial calf muscles.

patient with minimal symptoms. Certain types of work will of course highlight any restriction and thus an athlete or a manual worker will be unable to tolerate the functional deficiencies that may be accepted by someone in sedentary employment.

Swelling

Rapid swelling of the knee after injury is usually noted accurately by the patient, whereas more gradual swelling may be misinterpreted with regard to both the site and extent of the swelling. An acute and tense swelling almost always means that bleeding has distended the joint, and this haemarthrosis is a sign that a vascular structure has been torn. Synovial and ligament tears will produce a haemarthrosis, as will intra-articular fractures. A peripheral tear through the vascular outer zone of the meniscus will be an occasional cause in the younger patient. In severe knee disruptions blood leaks out through the synovial and capsular tear. An ecchymosis develops, resulting in widespread bruising that may track down the leg. These characteristics are described more fully in Chapters 2 and 3.

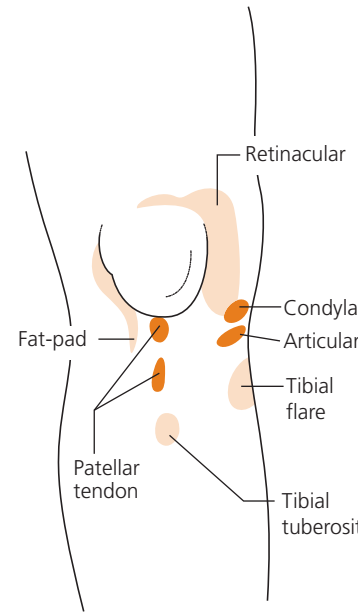
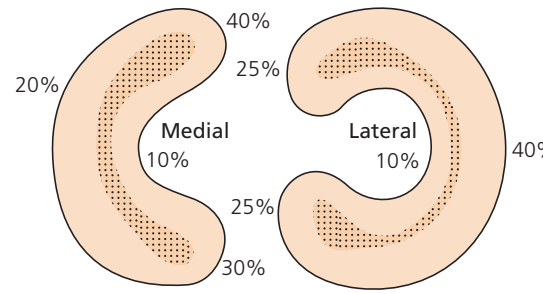


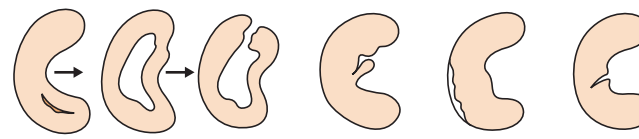
Figure 1.10 Typical sites of referred pain and local tenderness over the anterior aspect of the knee.

Gradual swelling from meniscal injury or a sprain will fill the synovial cavity over a 24-hour period. The associated enlargement of the suprapatellar pouch (Figure 1.12, see also Figures 2.6, p. 17, and 2.7, p. 18) may be a source of confusion. Discrete swellings (Figure 1.13) develop insidiously but vary in size less than an effusion.

Classically, a mild effusion occurs after a twisting injury of the knee. In patients with inflammatory disease or a bleeding condition such as haemophilia minor trauma may produce



(a)



Progression of a vertical tear to a bucket handle lesion and then a pedunculated tag

Radial tear with tag

Peripheral split with displacement

'Parrot beak' radial tear

(b)

Figure 1.11 (a) The approximate incidence of traumatic tears at various sites in both menisci; (b) the three diagrams to the left show the typical progression of a posterior, vertical meniscal tear to a 'bucket handle' lesion and eventually to a pedunculated tag; the three diagrams to the right show an inner rim tag, a peripheral split causing slight meniscal displacement and a 'parrot beak' radial tear.

a disproportionately large swelling. Normally the swelling disappears with rest and reoccurs with further activity or stress. Detection of this fluid is an important part of knee examination (Chapter 2), allowing a gradation from mild, to moderate (lax), to major (tense). The physiotherapist or doctor can use the presence or absence of an effusion after exercise as the monitor of the progress of a patient, the promotion of an effusion indicating that the speed of rehabilitation is too fast for that stage of healing. If a synovitis with its associated effusion becomes established it may respond to a non-steroidal anti-inflammatory agent (Chapter 9). Magnetic resonance (MR) scanning or arthroscopic review of the pathological lesion may eventually be indicated to assess the stage of healing after injury or earlier surgery.

If a patient states that the knee regularly becomes swollen, but no convincing effusion or discrete swelling can be detected on the day of examination, it is often instructive to request that the patient returns on a day when the swelling is apparent, perhaps provoked by exertion. Defining the site, nature and periodicity of the swelling is an important aspect of careful clinical examination.

Figure 1.12 Generalized swelling of the knee in juvenile chronic arthritis.

(a)

(b)

(c)

Figure 1.13 (a) The discrete swelling of prepatellar bursitis ('housemaid's knee'); (b) the popliteal cyst in childhood usually disappears; (c) a left quadriceps ganglion.

Instability

Direct or indirect trauma may make the knee joint incompetent when bearing the weight of the body. Buckling or instability is the symptom, pathological laxity the sign. Angulatory and rotational stress cannot be resisted. Instability of this sort can be very troublesome as the knee gives way in an unexpected and often dangerous way. Anterolateral instability, when the convex lateral tibial condyle and lateral meniscus sublux under the lateral femoral condyle, causes a feeling of two knuckles rubbing against each other and a painful buckling results (Chapter 5).

Ligament tears in various combinations account for most instances of gross instability but the knee may also give way under load if the patella subluxes/dislocates laterally or if the axis of motion is impeded by an obstructive meniscus or a loose body. Additional causes of buckling include chronic quadriceps weakness or a reflex inhibition of thigh muscle contraction owing to an obstructive and painful lesion in the joint. This functional instability may occur when a person is climbing ladders or negotiating rough ground, when the quadriceps mechanism is under greater load. Chronic angular deformity, whether congenital or acquired, may also lead to instability, often compounded by ligament laxity or muscle weakness.

Personality

The perception of the cardinal symptoms – pain, loss of movement and instability – will be influenced by the demands placed on the joint by individuals as well as their personality and expectations of physical fitness. Highly tuned athletes tolerate poorly a relatively minor impairment that a less active person may accept perfectly readily. A clicking sensation in the joint and patellofemoral crepitus are common features but may provoke considerable anxiety in the introspective individual. One patient may shrug off a symptom or adapt to it, whereas for another the persistence of a minor disability may preoccupy the mind. During adolescence, pains in the knee may prove very troublesome for not only the patient but also the parents, and eventually the doctor and physiotherapist. There may come a time when the patient is asked 'to live with the pain' if diagnostic efforts have drawn a blank.

Such counsel is often hard to give and even harder to accept. But if all investigations have proved unconvincing for pathology, and the possibility of referred pain ruled out, advice that the patient will have to endure the symptoms is often accepted if there has been a frank explanation of the position (Sandow and Goodfellow 1985). In childhood the 'growing pains' experienced may lessen with stretching exercises and with time (Chapter 4). During adolescence some hope should also be entertained that the condition may resolve at the end of skeletal growth or in early adult life. A change in lifestyle and sporting interests may prove beneficial.

Age-related symptoms

The age of the patient is an important factor and will indicate the likely causes of the symptoms (Table 1.1). In children, problems usually relate to patellar malalignment syndromes, congenital abnormalities (such as a discoid lateral meniscus), stress or avulsion fracture, and

Table 1.1 Common causes of knee symptoms related to the age and sex of the patient

Age (years)	Sex	
	Female	Male
5–10	Discoid lateral meniscus	Discoid lateral meniscus
	Synovitis or arthropathy	Synovitis, arthropathy, haemophilia
	Fractures	Fractures
	Patellar instability	Soft tissue tumours
	Soft tissue tumours	Patellar instability
10–20	Patellar instability	Osteochondritis dissecans
	Patellar pain (?stress)	Meniscal tears
	Ligament rupture	Osteochondroses
	Osteochondritis dissecans	Patellar instability
	Fracture	Fracture
	Arthropathy	Ligament rupture
		Arthropathy
20–30	Patellar instability	Meniscal tear
	Cystic lateral meniscus	Ligament rupture
	Arthropathy	Fracture
	Ligament rupture	Arthropathy
	Meniscal tear	Cystic lateral meniscus
30+	The problems detailed above, often superimposed on increasing degenerative changes	

arthropathies, including juvenile chronic arthritis. Meniscal tears are relatively rare so other causes of apparent knee locking should be considered, including osteochondritis dissecans.

After puberty, girls are prone to patellar pain; this may be related to compression stresses or instability of the knee cap secondary to torsional abnormality of the legs, to ligament laxity or to a growth spurt. The source of symptoms may be so puzzling and inextricably linked with emotional factors that intervention by the surgeon may do more harm than good (Figure 1.14).

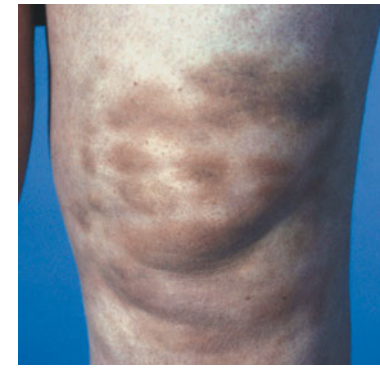


Figure 1.14 Factitious bruising produced by the patient striking the knee in the region of the anterior 'window' of a canvas knee splint.

With juvenile athletes, patellar tracking, an apophysitis, a discoid meniscus or osteochondritis dissecans may be responsible. Ligament injuries are unusual but stress fractures are not. Bone bruising often shows up on the MR scan. The possibility of significant alternative pathology, such as infection or neoplasia should be considered. Meniscal tears are more frequent in later adolescence and a traumatic synovitis or traction apophysitis can prove troublesome. Lastly, in the 'mature' athlete, between the ages of 20 and 70 years these days, ligament sprains and ruptures, synovial fringe and fat pad lesions and degenerative changes must be added to the list of possible diagnoses.

The ensuing chapters will outline the approach to a knee injury or repetitive stress lesion. Many associated conditions have to be considered as they will influence susceptibility and recovery. Both the patient and the therapist must accept that some injuries and acquired dysfunction will not be completely cured. Early, and appropriate, treatment should nevertheless speed recovery and minimize the risk of long-standing morbidity.

References

Dandy DJ (1990) Arthroscopic anatomy of symptomatic meniscal lesions. *J Bone Joint Surg Br* **72**, 628–31.

Noble J and Erat K (1980) In defence of the meniscus: a prospective study of 200 meniscectomy patients. *J Bone Joint Surg Br* **62**, 7–11.

Noble J and Hamblen DL (1975) The pathology of the degenerate meniscus lesion. *J Bone Joint Surg Br* **57**, 180–6.

Sandow MJ and Goodfellow JW (1985) The natural history of anterior knee pain in adolescents. *J Bone Joint Surg Br* **67**, 36–9.

Trillat A (1962) Lésions traumatique du ménisque interne du genu. Classement anatomique et diagnostic clinique. *Rev Clin Orthop* **48**, 551–63.

2

Methods of clinical examination

Introduction

Careful examination of the knee is essential before enlisting additional tests or arranging arthroscopic and other forms of surgery. The history very often suggests the diagnosis. If the physical features are elicited precisely, the diagnosis may be clinched and the patient will have greater confidence in the therapist. Attention to the details of examination may also save the patient an unnecessary number of investigations and should allow the examiner an authoritative approach to the problem.

The routine

It is always helpful to follow a routine as it will make errors of omission less likely and also helps in the layout of the subsequent clinical notes and letter. At the beginning, determine if the dynamic tests of walking, squatting, 'duck-waddling' and extension of the knee against gravity should be carried out before or after examination of the patient on the couch. A limp may be caused by symptoms in the knee or weakness, and may also indicate that an abnormality affects the hip or the rest of the leg. It is important to assess the locomotor system more generally to rule out obvious neurological disease and to consider medical conditions that may influence knee function. This applies to the arthropathies, haematological conditions and to congenital or inherited diseases. Particular attention should be paid to abnormalities of the lumbar spine, hip joint, leg musculature, ankle and foot, and to possible leg-length discrepancy.

The patient should be undressed sufficiently to allow a comprehensive review of the spine, hip and lower limb. Valgus, varus and torsional deformities should be noted and compared with the contralateral leg. Hip stiffness and losses or increases of rotation may affect knee function adversely. Pain may radiate to the medial side of the knee by referral along the anterior branch of the obturator nerve, as seen in slipped capital femoral epiphysis (SCFE). Radiographs of the knee are therefore sometimes found in the case notes of a patient with obvious shortening and external rotation of the leg resulting from SCFE. The patellofemoral joint may become symptomatic secondary to a number of abnormalities, as discussed in Chapter 7.

Inspection

Looking at the knee from both the front and the back is a logical first inspection. The appearance of the skin, the presence of scars and their width, the position of any swellings

(Figure 2.1) and the bulk of both thighs should be noted. Bruising or an ecchymosis indicates the site and severity of injury, a boggy, ill-defined swelling suggesting major ligament and capsular disruption. Other, more discrete, swellings include the lateral (or sometimes medial) meniscal cyst, prepatellar or infrapatellar bursae, ganglia, a popliteal cyst or semimembranosus bursa, swellings in relation to the pes anserinus (sartorius, gracilis and semitendinosus muscle insertions) and saphena varix. Acute injuries may be accompanied by blistering, contusions and haematoma, and abrasions or lacerations.

The chronically injured or inflamed knee will show a classical reversal of contour, in that the thigh muscles waste, while the synovial and capsular envelope enlarges owing to fluid or synovial hypertrophy.

Patella alta (see Figure 4.4, p. 61) may predispose the patient to both patellar pain and lateral subluxation so the positioning and tracking of the patella should be carefully observed during

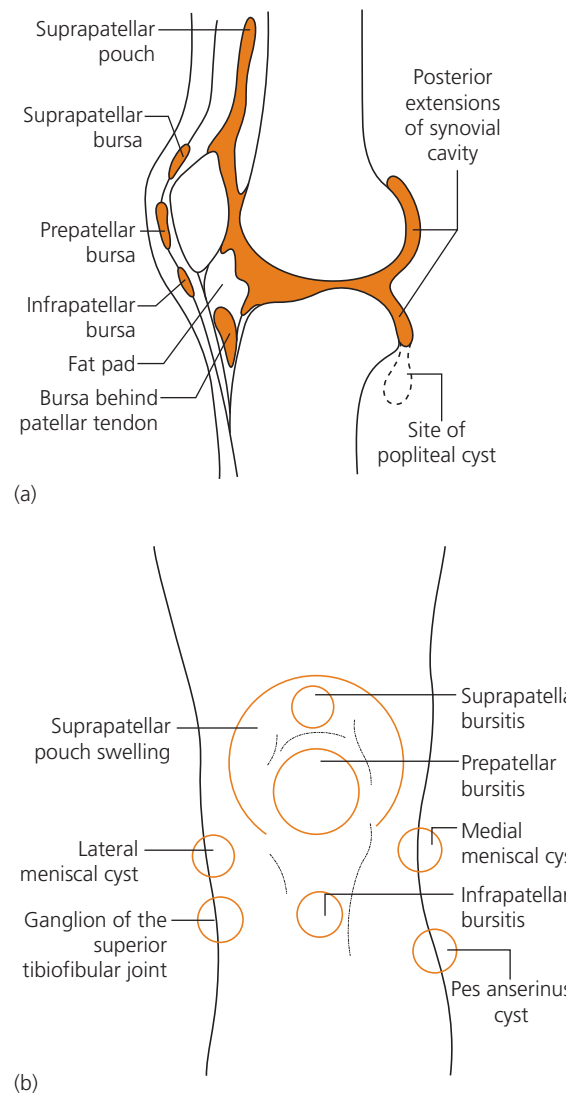


Figure 2.1 Cystic swellings around the knee: (a) from the side (cross-section), (b) from the front.

the course of the clinical examination (Figure 2.2). Linked with any patellar problem is the functioning of the quadriceps muscles, most accurately measured by:

- Comparison (from the foot of the couch) with the opposite thigh and palpation of the tone of the quadriceps muscles, particularly vastus medialis, when the patient forcibly extends the knee
- Assessment of thigh circumference, using a tape measure at two defined levels above the tibial tuberosity or the upper edge of the patella (Figure 2.3).

Measurement of the calf girths in both legs is also recommended and may indicate whether the affected leg is being favoured or is primarily weaker.

During the assessment of the knee it is possible to form certain opinions about not merely the physique of the patient but also something of the personality. The response of the patient to questioning and examination often gives vital clues about the manner in which each individual is likely to react to injury, pain and life in general. Small grimaces of discomfort are more helpful in deciding where tenderness is located than loud and sometimes unconvincing exclamations from the patient. This is open to misinterpretation, of course, but the interplay between the personality of the patient and the examiner has a greater influence on the diagnosis, and the eventual outcome, than is generally admitted.

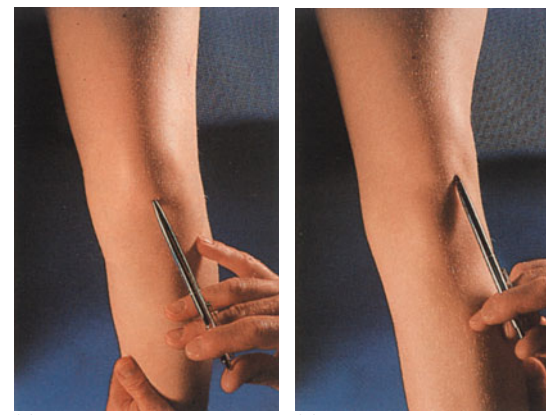


Figure 2.2 (a) The left patella lies above the femoral sulcus but is centrally positioned; and (b) on contracting the quadriceps (or flexing the knee) the patella shifts laterally.

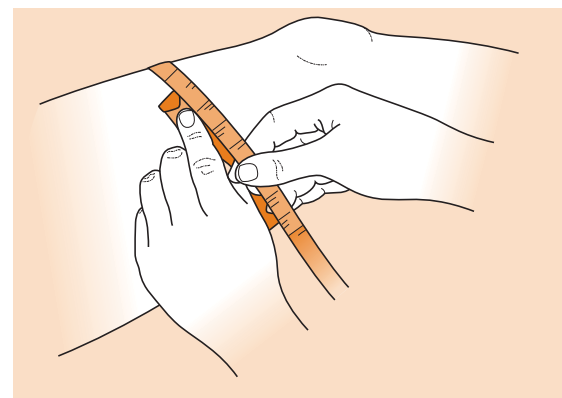


Figure 2.3 Measurement of the thigh circumference with a tape. The technique is only slightly more accurate than assessing the girth of the thigh by eye.

At this stage the presence of generalized ligament laxity and of skin conditions such as psoriasis and eczema should be noted as these may not only be important aetiologically but may also exert an adverse effect on recovery from synovitis. The stigmata of juvenile chronic arthritis and haemophilia are usually clear and documented in the past history of the younger patient (Chapter 9). Yet an injury or spontaneous symptom may be the first manifestation of a systemic condition so that arthropathies, including those secondary to venereal disease, should be remembered in the assessment.

Finally, it is important to stress that both the normal and symptomatic legs should be properly reviewed. The contralateral leg is the baseline from which to work and the problem knee must be compared with its fellow throughout the examination. Alignment and other subtle characteristics will be more obvious through careful comparison.

Palpation

Feeling the temperature and texture of the skin and the tone of muscle groups offers clues to the diagnosis. Roughened skin overlying the patella may have resulted from kneeling a great deal occupationally, with dire effects upon the retropatellar surface. Hypersensitivity may be due to a cutaneous neuroma. Inflammatory conditions produce increased warmth and thickening of the soft tissues. Normal synovium, when picked up between finger and thumb, is barely discernible. However, when engorged and oedematous, a distinct sensation of two slightly rubbery layers moving against each other can be felt. Effusions of varying degree may be encountered. The swollen knee may be principally the result of synovial hypertrophy, a haemarthrosis or effusion, or a combination of both.

Swellings

Swellings may be localized or generalized. The common sites for discrete swelling are over the lateral joint line, in relation to the patella, in the popliteal fossa and arising from muscles such as the semimembranosus and pes anserinus. Some swellings are more obvious when the knee is straight, such as effusions and popliteal cysts (which often co-exist), while others are made obvious by flexing the knee (Figure 2.4).

Before assessing the volume of an effusion it is of value to determine the likely contents of any smaller swelling. Hard lumps which do not transilluminate light are usually bony excrescences and may be overlain by a bursa. Chondral loose bodies may be palpated around the joint margins although in synovial chondromatosis the fragments are very small. An osteochondral loose body of any size may be palpable intermittently, and often by the patient, within the confines of the capsule. In contrast, osteochondromas are present at the metaphysis, a few finger-breadths away from the joint line.

Ganglia and cysts related to tendons may feel firm or even hard when tense, but have a habit of varying in size, a fact often commented on by the patient. Cystic swellings are considered classically to transilluminate, yet many such cysts are deeply placed and loculated, so that convincing transillumination is impossible. Lipomas and other soft tissue lumps may also transmit light in a non-specific manner and hence ultrasound scanning proves to be a very useful discriminant when clinical examination identifies these superficial swellings.

Some swellings may also empty when compressed because a valve-effect is present. This accounts for the periodicity of discomfort in, for example, the popliteal cyst, which is connected to the cavity of the joint (Figure 2.1a).