OPHTHALMOLOGY
MADE EASY

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Contents

Foreword

Ophthalmology is a fascinating and wide-ranging high-volume outpatient specialty which has grown immensely due to recent advances in treatment and an ageing population demographic. This book provides a well-organized, practical and up-to-date approach to triage and diagnosis of a comprehensive range of common eye problems for a wide range of clinical practitioners.

The approach incorporates ophthalmic history-taking, examination and imaging methods, along with explanation of eye terminology, abbreviations, common eye medications and chapters on systemic infectious and inflammatory diseases. Important clinical concepts are highlighted in red. *Chapters 5* and *6* highlight important triage questions and symptoms which would be of particular interest to anyone doing clinical triage, such as GPs or GP trainees, nurses in A&E, eye emergency department, minor injury units or community optometrists doing minor eye conditions scheme or working in eye emergency departments. The book is superbly illustrated to support the clinical features of different eye conditions. Junior Ophthalmology trainees will find this book useful in the clinical setting for their patient care and knowing when to call for help or advice.

Ophthalmologists of all levels will find this text a useful teaching tool, particularly for providing a structure to teaching and simplifying complex topics and emphasizing important concepts for a non-specialist audience.

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Preface

Ophthalmology remains a bit of a dark art in the clinical world. It is barely covered in medical and clinical curriculums. Eye emergencies, however, can manifest themselves in any corner of the clinical environment, whether it be the GP surgery, outpatient clinic or A&E.

The first aim of this book is to build the confidence of non-ophthalmic clinicians on the initial assessment, management and onward referral to ophthalmology by discussing a) how to do the basics, b) what, and how, you can manage yourself, and c) when you might need to phone a friend. It will guide you through what to ask (and how to handle) that patient in your GP surgery with floaters, the patient on the ward with a red eye, or the patient in A&E with loss of vision.

The second aim is to give junior ophthalmologists the essential tips on how to manage some of the more common conditions they will encounter when they initially start their ophthalmology training. We appreciate that many books cover the foundations of ophthalmology superbly, in terms of anatomy, physiology and pathology, but we want this book to serve as an accessible reference guide.

It will be useful for medical students, foundation doctors, GPs, A&E doctors, junior ophthalmology specialty trainees, ophthalmic nurses and nurse practitioners, ophthalmic technicians or anyone looking to refresh their knowledge of diagnosis, management and referral to ophthalmology.

This is the book we wish we had had as medical students and juniors.

Michelle Attzs
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About the authors

Michelle Attzs

Michelle is a post CCT fellow of the Royal College of Ophthalmologists, who completed her training with the East Midlands Deanery, which includes Nottingham University Hospitals NHS Trust where she was awarded Trainee of the Year 2019. She has completed two prestigious fellowships in paediatric ophthalmology and strabismus at Wilmer Eye Institute, Johns Hopkins and Bascom Palmer Eye Institute, University of Miami. Throughout her career, Michelle has been dedicated to teaching peers both within and outside the field of ophthalmology, and her ultimate goal is to equip learners with the tools to appreciate and understand the structure, function and disease of the eye. Michelle is currently an Attending Physician at Nemours Children's Health, Jacksonville, Florida.

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Twishaa is a Specialist Registrar Ophthalmologist at East Suffolk & North Essex NHS Foundation Trust in the East of England Deanery; this includes Cambridge University Hospitals where she was awarded the Marie Comer Ophthalmology Prize. She was awarded the Harcourt Gold Medal in 2023 for the highest mark achieved in the final Fellowship of the Royal College of Ophthalmologists Exit Examinations on her first attempt. She is now a formal examiner for the Royal College of Ophthalmologists. She is currently also undertaking an MSc at the University of Oxford. She has a heartfelt passion for teaching ophthalmology and making it accessible to those who are new to the subject.

Contributors

The completion of this book would not have been possible without the contribution to each chapter by ophthalmologists and allied ophthalmology staff around the world.

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How to use this book

Chapters 1 and *2* give a primer on how to take a basic eye history and examine an eye without any specialist equipment, so that outside of the ophthalmology department, you can still make safe diagnoses and referrals. *Chapters 3* and *4* provide a glossary of common ophthalmic terminology and medication, which will be a useful reference when reviewing those ophthalmology letters. For triaging eye complaints, use *Chapters 5* and *6* to 'sort the symptoms' and help decide how soon you need to refer the patient or, if you are the one working in ophthalmology, when to accept them.

Chapters 7 to *16* offer a system-based approach to each part of the eye. They highlight common and important conditions whilst describing how to assess, investigate, manage and refer if needed, and what to do if you're the first ophthalmic clinician seeing the patient. *Chapters 17* to *20* describe common ophthalmic investigations, and *Chapters 21* and *22* cover ophthalmic manifestations of systemic disease.

Throughout the book, symbols are used to highlight what parts of assessment and management are relevant to non-ophthalmic and ophthalmic clinicians.

This symbol indicates history, examination, investigations or management that could or should be undertaken in a non-ophthalmology setting. Such sections are aimed at non-ophthalmic clinicians.

This symbol indicates history, examination, investigations or management that could or should be undertaken by an ophthalmologist or clinician working in an ophthalmology department. Sections marked thus are aimed at junior ophthalmology specialty trainees, ophthalmic nurses and nurse practitioners.

CLINICAL CONTEXT TIPS

These boxes will help to add 'the bigger picture' or further your understanding of the conditions described.

RED FLAG

These boxes highlight important clinical concepts that should never be missed.

Bold text highlights key referral tips. Red text highlights sight- or life-threatening pathology.

Image acknowledgements

The majority of the images included in the book are from our personal collections and from the collections of the contributors. For other images, we have indicated their source, and we thank the publishers and authors for granting permission.

General abbreviations

For specific abbreviations used in an ophthalmology report, see *Chapter 3*.

A&E	Accident and Emergency
ACD	anterior chamber depth
ACE	angiotensin-converting enzyme
ANA	antinuclear antibodies
ARN	acute retinal necrosis
BG	blood glucose
BP	blood pressure
CCF	carotid-cavernous fistula
CN	cranial nerve
CNP	cranial nerve palsy
COPD	chronic obstructive pulmonary disease
CPEO	chronic progressive external ophthalmoplegia
CRP	C-reactive protein
CSF	cerebrospinal fluid
CSNB	congenital stationary night blindness
CT	computed tomography
DED	dry eye disease
DR	diabetic retinopathy
DVLA	Driver and Vehicle Licensing Agency
ECG	electrocardiogram
ENT	ear, nose and throat
ESR	erythrocyte sedimentation rate
FBC	full blood count
GI	gastrointestinal
GP	general practitioner
GPA	granulomatosis with polyangiitis
HIV	human immunodeficiency virus
HSV	herpes simplex virus
ICP	intracranial pressure
IOL	intraocular lens
LPS	levator palpebrae superioris
MDT	multidisciplinary team
MRI	magnetic resonance imaging
MuSK	muscle-specific kinase
NAI	non-accidental injury
NSAID	non-steroidal anti-inflammatory drug
PCR	polymerase chain reaction
PMR	polymyalgia rheumatica
PUK	peripheral ulcerative keratitis
RA	rheumatoid arthritis
RF	rheumatoid factor
RPE	retinal pigment epithelium
RVO	retinal vein occlusion
SJS	Stevens–Johnson syndrome
TED	thyroid eye disease
TIA	transient ischaemic attack
TSH	thyroid-stimulating hormone
VFD	visual field defect
VZV	varicella zoster virus

Chapter 9

Conjunctiva, cornea and sclera

9.1 Introduction

The anatomy of the conjunctiva, cornea and sclera was discussed in *Sections 2.5* and *2.6*. There are a number of conditions that can affect these structures, particularly infection, inflammation and dry eyes. Some conditions that affect the cornea and sclera can be sight-threatening, and in the case of the sclera, can also be life-threatening if inflammation is secondary to a granulomatous necrotizing vasculitis such as granulomatosis with polyangiitis (GPA) (see *Chapter 21*).

9.2 Dry eye disease

Dry eye disease (DED) is most commonly due to an evaporative reason, owing to the tears not remaining on the surface of the eye for a sufficient amount of time. This is often due to poor oil layer (see *Section 2.4.3*) production, caused by conditions such as blepharitis (see *Section 8.2*). Systemic conditions such as Sjögren's disease and rheumatoid arthritis, as well as eyelid disease and malposition, previous trauma, surgery, systemic medications and contact lens wear, can all cause DED.

History

Ask about:

- Onset and duration
- Laterality
- Burning
- Itching
- Foreign body sensation
- Stringy discharge
- Eye redness
- Watery eye, especially in cold or windy weather
- Vision changes
- Triggering event (trauma or surgery)
- Eyelid malposition or poor closure
- Contact lens wear
- Any dry mouth, i.e. does the patient have a diagnosis of Sjögren's disease?
- Medications.

Examination

In-depth examination of the eyelids, cornea and conjunctiva requires the use of a slit lamp and fluorescein 2% (see *Figure 2.12*). The following is a schematic examination that can be performed in the ophthalmology setting to assess the tear film and ocular surface integrity:

- Eyelids

- is there crusting of the eyelids (blepharitis), frothy discharge at the eyelid margin or styes / chalazia (meibomian gland disease)?
- are the superior and inferior puncta patent?

- Instil fluorescein 2% and observe under the cobalt blue filter
  - what is the tear break-up time? (TBUT; time in seconds between a blink and when the first dry spot appears on the cornea – less than 10 is abnormal)
  - are there punctate epithelial erosions? (PEEs; small circular areas of fluorescein uptake)
- Schirmer's test
  - assessment of tear production.

Management

- Elimination of blepharitis and meibomian gland disease (see *Section 8.2*)
- Lubricating eye drops
- If still symptomatic despite strict compliance with conservative measures, a **routine referral** can be made to general eye ophthalmology or cornea service for further input
- Reiterate to the patient to continue using their lubricating eye drops until reviewed by the specialist.

- Punctal plugs (to stop the tears draining as quickly)
- Escalation of eye drop management (ciclosporin and autologous serum).

CLINICAL CONTEXT TIPS

Patient advice on lubricating eye drops
It is important to reiterate to patients with DED that lubricating eye drops need to be used at least four times a day, and can be used up to hourly if necessary.

9.3 Conjunctiva

9.3.1 Conjunctivitis

Conjunctivitis is inflammation of the conjunctiva. Patients presenting with conjunctivitis will have a variety of symptoms depending on the aetiology. *Table 9.1* gives a quick reference to the type of symptoms related to the main cause of conjunctivitis and can guide history and examination.

Management

Most cases of conjunctivitis are viral or allergic and can be managed in the community. However, the following exceptions apply and require **urgent referral** to ophthalmology:

- Contact lens wearer
- Trauma with organic matter

- Where the conjunctivitis does not resolve after a second course of topical treatment
- Neonate less than 28 days old (see *Section 15.3.3*).

- Persistent or recurrent conjunctivitis (the '2 and 2 rule': lasting more than 2 weeks or 2 courses of antibiotics): swabs should be taken for microscopy, culture and sensitivity, viral polymerase chain reaction (PCR), and chlamydia.
- Follow-up for patients with conjunctivitis can be a clinical judgement, and dependent on the microbiology results.

Table 9.1 Key signs and symptoms of different types of conjunctivitis (excluding neonatal conjunctivitis; see *Section 15.3.3*)

Aetiology	Symptoms	Signs	Treatment
Bacterial	Gritty sensation / pain Red eye Eyelashes stuck together Unilateral, occasionally bilateral	Lid swelling Green or yellow discharge (copious in gonococcal infection) Papillae ('red top')	Topical antibiotics Gonococcal aetiology: topical antibiotics plus systemic cephalosporin
Viral	Gritty sensation / pain Red eyes Unilateral but spreads to be bilateral Recent cold-like infection	Lid swelling Watery / 'stringy' discharge Follicles ('white top'; *Figure 9.1*)	Artificial tears Cool compresses Herpes simplex aetiology: topical antivirals
Chlamydial	Gritty sensation Red eye Unilateral	Copious discharge Follicles (*Figure 9.1*)	Topical chloramphenicol Oral antibiotics (azithromycin or doxycycline)
Allergic	Itchy sensation Red eyes Swelling of eyelids Bilateral	Lid swelling Watery / mucoid discharge Papillae	**Mild**: artificial tears **Moderate**: mast cell stabilizer or topical antihistamine and oral antihistamine **Severe**: topical immunosuppressants

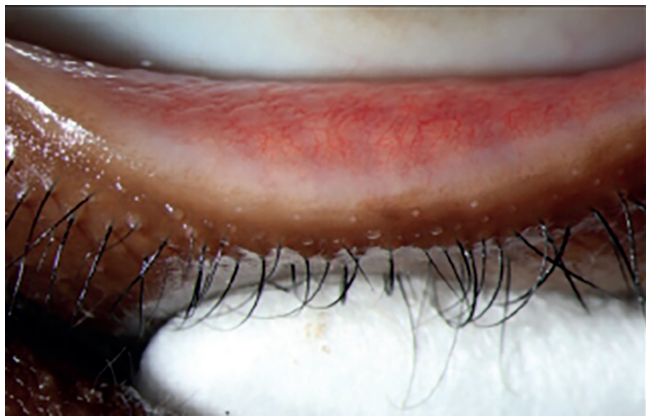


Figure 9.1 Follicular conjunctivitis: lymphoid hyperplasia with vascular base.

- Cornea specialist help should be sought early in cases which involve the cornea (corneal vascularization and opacification; *Figure 9.2*) or in older patients (>60 years) where there is concern for ocular mucous membrane pemphigoid with symblepharon formation (*Figure 9.3*).

CLINICAL CONTEXT TIPS

How to manage persistent conjunctivitis
Persistent unilateral conjunctivitis should raise the suspicion of chlamydial conjunctivitis (see *Table 9.1*). The patient should be counselled for the eventuality of a positive result, and the importance of systemic treatment should be stressed. It should even be considered in children with persistent unilateral infection, and parental discussion is key due to the safeguarding implications.

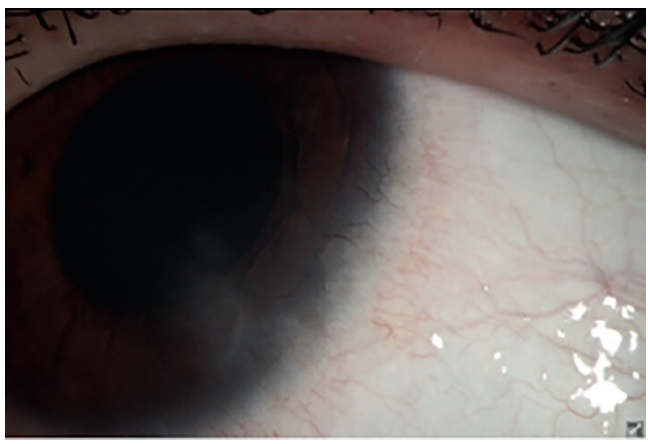


Figure 9.2 Corneal vascularization and opacity secondary to blepharokeratoconjunctivitis.

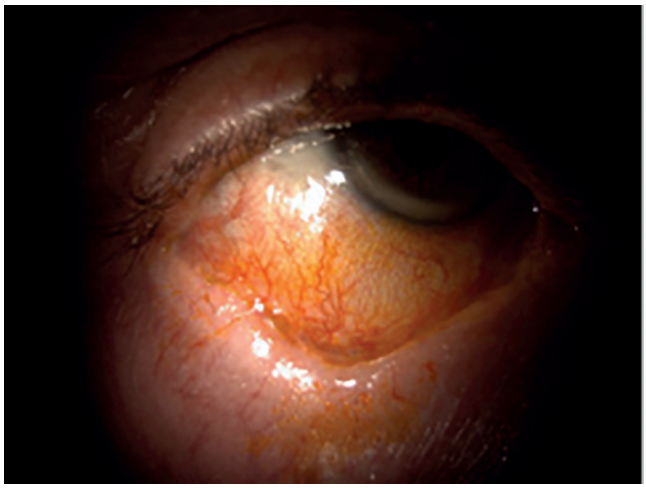


Figure 9.3 Symblepharon with shortening of the inferior fornix.

9.3.2 Conjunctival lesions

A number of lesions can involve the conjunctiva, and range from pigmented (e.g. a naevus; *Figure 9.4*) to non-pigmented (e.g. a pinguecula, *Figure 9.5* or a pterygium, *Figure 9.6*) and neoplastic (e.g. ocular surface squamous neoplasia, *Figure 9.7*). A thorough history would give clues to diagnosis, but only through examination can a firm diagnosis be made. Conjunctival lesions may or may not be apparent with the use of a pen torch for a close inspection, and therefore only slit lamp examination can allow the ophthalmologist to look for features indicative of a particular diagnosis.

History

The determination of the need for referral to your local ocular surface service may be determined by asking the following questions:

- Change in size?
- Change in colour?
- Increased redness?
- Pain?
- Changes in vision?
- Is there any sign or symptom of infection or inflammation (photophobia or light sensitivity, eye redness)?

Management

Referrals are made on the basis of:

- Acute symptoms (such as pain, increased redness or drop in vision) which should be made for review on a **same day referral**
- Any concern for malignancy should be referred to **fast-track clinic**
- Asymptomatic pinguecula and pterygia **do not require referral**
  - irritative symptoms:

- lubricating eye drops
- **refer routinely** for ophthalmology review to consider topical steroids

- pterygia can be **routinely referred** for consideration for surgery if causing significant astigmatism or refractory discomfort, or if they are encroaching on the visual axis.

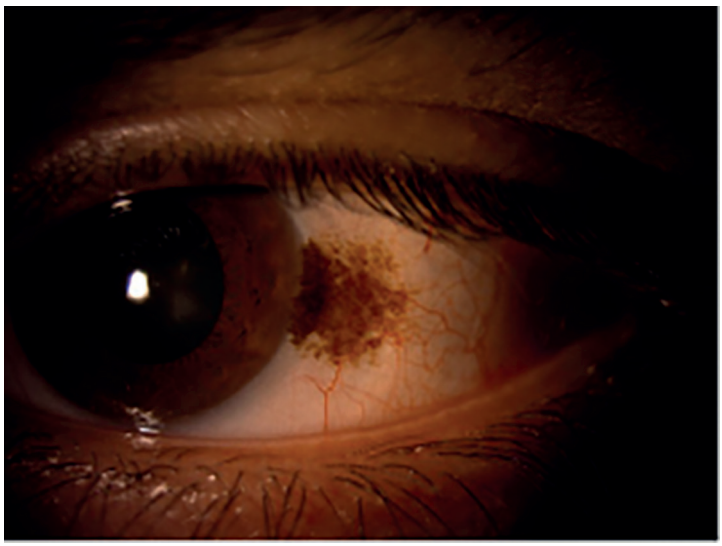


Figure 9.4 Conjunctival naevus; cysts and lack of feeder vessels are a reassuring sign. Usually present from childhood, may increase in size / darken during puberty.

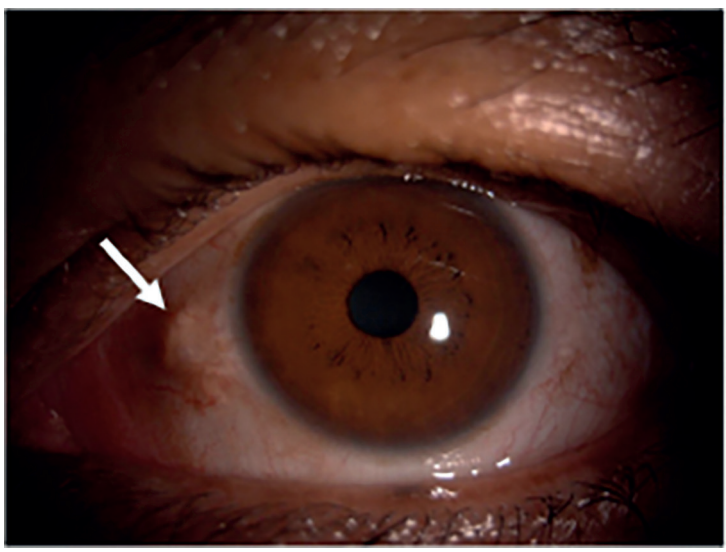


Figure 9.5 Pinguecula of nasal conjunctiva (white arrow).

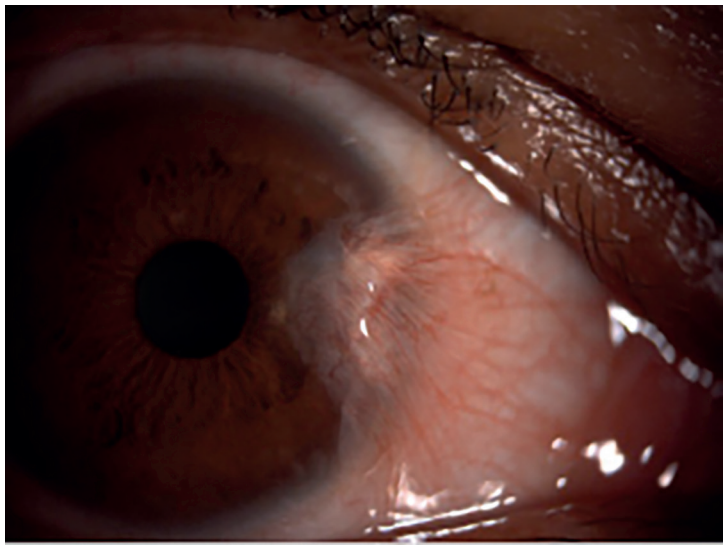


Figure 9.6 Pterygium.

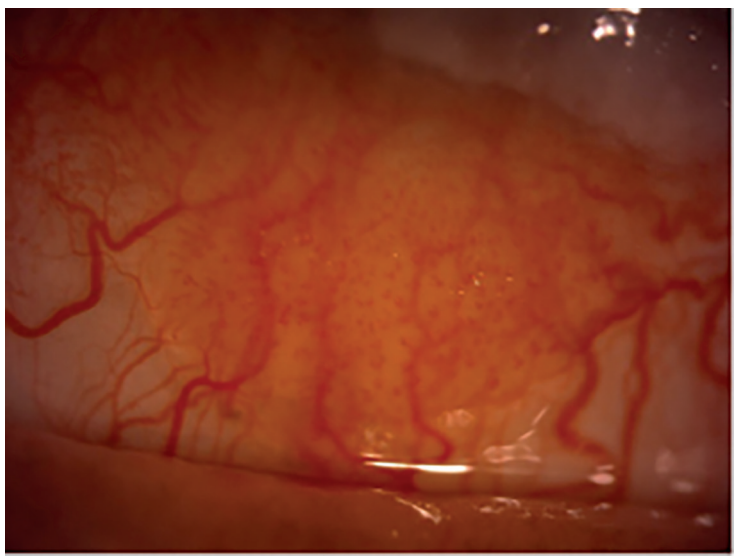


Figure 9.7 Ocular surface squamous neoplasia: conjunctival intraepithelial neoplasia (gelatinous, vascularized mass with feeder vessels. Requires topical chemotherapy / immunotherapy and a 'no-touch' surgical excision.

9.4 Corneal ulcers

Corneal ulcers can have devastating consequences for the sight of a patient. Risk factors include contact lens wear, trauma, ocular surface disease, lid disease, nasolacrimal duct disease, immunosuppression and nutritional deficiency.

History

Ask about:

- Onset and duration
- Pain
- Red eye
- Eyelid swelling, redness or malposition
- Reduced vision
- Discharge
- Photophobia
- Trauma
- Contact lens wear
- Dry eye disease
- Immunosuppression
- Malnutrition.

RED FLAG

All contact lens wearers with a red painful eye must be referred the same day to local eye services.

All patients suspected of having a corneal ulcer need **immediate referral** to eye services so that the correct treatment can be instigated. *Section 2.4* indicates how assessment of the anterior segment without a slit lamp can be performed.

Examination

Examination should include baseline visual acuity and IOP.

- Assess:
  - type of corneal ulcer (an epithelial defect with underlying stromal infiltrate)
  - depth (does it affect all layers of the cornea?)
  - evidence of thinning
  - Seidel's sign (leak from anterior chamber due to perforated cornea) with fluorescein 2% instilled
  - foreign body
  - anterior chamber activity (cells or flare)
  - hypopyon
- Look for eyelid disease
- Palpate lacrimal sac for regurgitation.

Investigations

- Corneal ulcers >1.5mm in diameter should be scraped for microbiology analysis (see *Box 9.1* for corneal scrape technique).

Management

- Treatment is instigated based on local cornea and microbiology guidelines. Choice of agents for topical antibiotic treatment include fluoroquinolones such as levofloxacin or fortified cephalosporins such as cefuroxime.

CLINICAL CONTEXT TIPS

Patient advice on treatment for corneal ulcer
Warn the patient they may have to treat with drops hourly day and night for the first 48 hours.

- Cycloplegia (e.g. cyclopentolate 1%) should also be included for pain management.
- Criteria for admission include:
  - corneal ulcer >1.5mm with central location and complicated by hypopyon or perforation (impending or frank)
  - patients not able to physically administer the drops independently, or those who do not have a support system at home to help them
  - poor compliance
  - monocular patient
  - limited improvement.

CLINICAL CONTEXT TIPS

Assessment of patient for intensive drop instillation
If there is any doubt about the patient's ability to self-administer drops, test this in the clinical area. Also check that carers assisting patients are able to administer the drops correctly.

- Follow-up is intensive for the first 24–48 hours. If there is improvement then the follow-up period can be extended.

CLINICAL CONTEXT TIPS

Social consideration for patient with corneal ulcer
Assess the patient's transport situation for returning for review in the acute phase. There should be a low threshold for admission if the patient will have issues returning for clinical review.

- Advise the patient of the importance of compliance (*"this condition is potentially blinding if we do not control it now"*).

- Specialist cornea advice should be sought if the clinical presentation is not typical, there is no improvement despite good compliance with treatment, in cases of impending or frank perforation, or concern for *Acanthamoeba* keratitis in a contact lens wearer.

BOX 9.1: CORNEAL SCRAPE TECHNIQUE

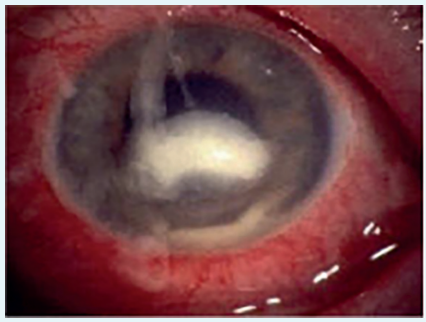
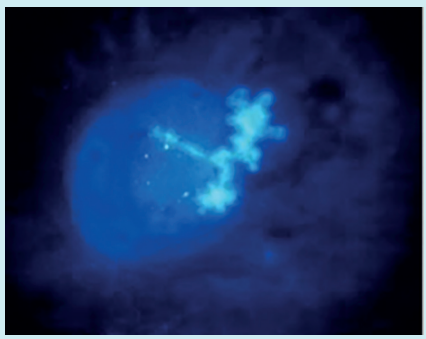
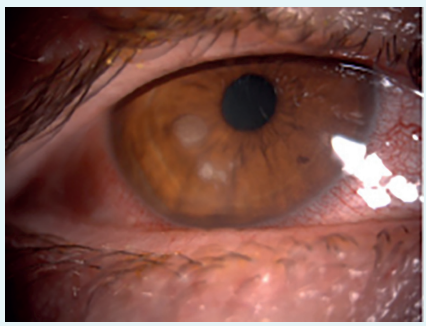
Corneal scrapes should only be performed by an ophthalmologist. Depending on the clinical picture, advice should be sought from your local microbiology department on what should be used to capture the sample.

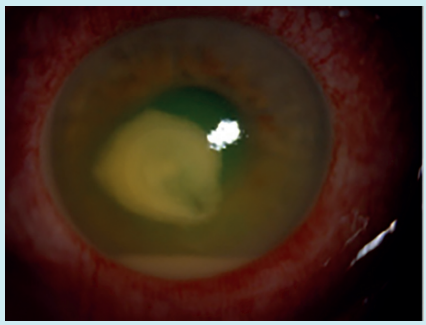
1. Ensure that the procedure is explained to the patient and consent given.
2. Reiterate the importance of keeping still to the patient to ensure safety during the procedure.
3. Position the patient on the slit lamp.
4. Have a low threshold for using an eyelid speculum to keep eyelids open.
5. Instil preservative-free topical anaesthetic to the eye to be sampled.
6. Example of the equipment required to capture the sample is as follows (**NB**: each eye service will have a standard protocol for sending corneal scrapes to microbiology, so be sure to consult with local guidelines. For fungi and *Acanthamoeba*, confocal microscopy is the non-invasive diagnostic tool of choice):
    - Glass slide for microscopy and staining (circle the area where the sample is on the slide with a permanent marker pen)
    - Blood agar (for most bacteria and fungi, including bacteria demonstrating haemolysis)
    - Chocolate agar (for *Haemophilus, Neisseria* and *Moraxella*)
    - Sabouraud agar (for fungi).
7. Use, for example, a 25G needle (again, consult with your local cornea service to gain advice on the best equipment to use) to collect the sample.
8. Use a new needle for each sample collected.
9. Take the sample from the area of the ulcer with the greatest microbe load, e.g. the base or the edge of the ulcer.
10. Ensure all samples are appropriately labelled before sending the sample to your local microbiology department.
11. Advise the patient to continue with topical medication pending microbiology report.

9.4.1 Aetiology

Corneal ulcers can be bacterial, viral, fungal, inflammatory or due to contact lens related keratitis (*Table 9.2*).

Table 9.2 Key features of corneal ulcers

Aetiology	Key features
Bacterial 	Circumcorneal injection Epithelial defect Stromal opacity (white/yellow/grey) Anterior uveitis / hypopyon Aetiology ● Gram +ve (*Staph. aureus, Staph. epidermidis, Strep. pneumoniae*) ● Gram –ve (*P. aeruginosa, N. gonorrhoeae, Haemophilus*)
Viral 	Spectrum ● Blepharoconjunctivitis ● Epithelial involvement (see image; dendritic lesion or geographic ulcer) ● Stromal keratitis (stromal oedema and opacity) ● Disciform keratitis (endothelial involvement) Aetiology ● Herpes simplex (pictured) ● Herpes zoster
Fungal 	Insidious or rapid onset Feathery branching or satellite lesions Anterior uveitis / hypopyon

Aetiology	Key features
Contact lens related keratitis 	Rapid onset in a contact lens wearer Central location Epithelial defect Corneal thinning Ring-like stromal infiltrate Anterior uveitis / hypopyon Aetiology – often bacterial but can be amoebic ● *P. aeruginosa* (pictured) ● *Acanthamoeba*: insidious onset differentiates it from other aetiologies

BOX 9.2: ADVICE TO CONTACT LENS WEARERS

- No swimming, showering or sleeping in lenses (the 3 Ss)
- Do not insert contact lens if eye is red, irritated or painful
- Always have a spare pair of glasses at home for times when contact lens wear is not possible.

9.5 Peripheral corneal disease

Peripheral corneal disease (*Figure 9.8*) occurs where there is peripheral corneal ulceration of varying degrees; this can be in isolation or due to life-threatening systemic conditions.

Peripheral corneal disease requires in-depth examination by an ophthalmologist at the slit lamp. The role of non-ophthalmic colleagues is to recognize that this condition should not be treated in the community.

9.5.1 Marginal keratitis

- Marginal keratitis occurs as a sequela to lid margin disease (which can occur due to blepharitis, atopy and rosacea) and a hypersensitivity reaction to *Staphylococcus* microbes on the lid – i.e. an inflammation, not a frank infection.
- Patients will present with foreign body sensation, sectoral redness, pain or discomfort.
- The clinical features include a peripheral corneal infiltrate, with overlying epithelial ulceration.
- The key distinguishing feature on slit lamp examination is an area of clear cornea between the area of ulceration and the limbus.
- Treatment is with a combination of topical corticosteroid and antibiotic, but the offending lid disease must also be treated.

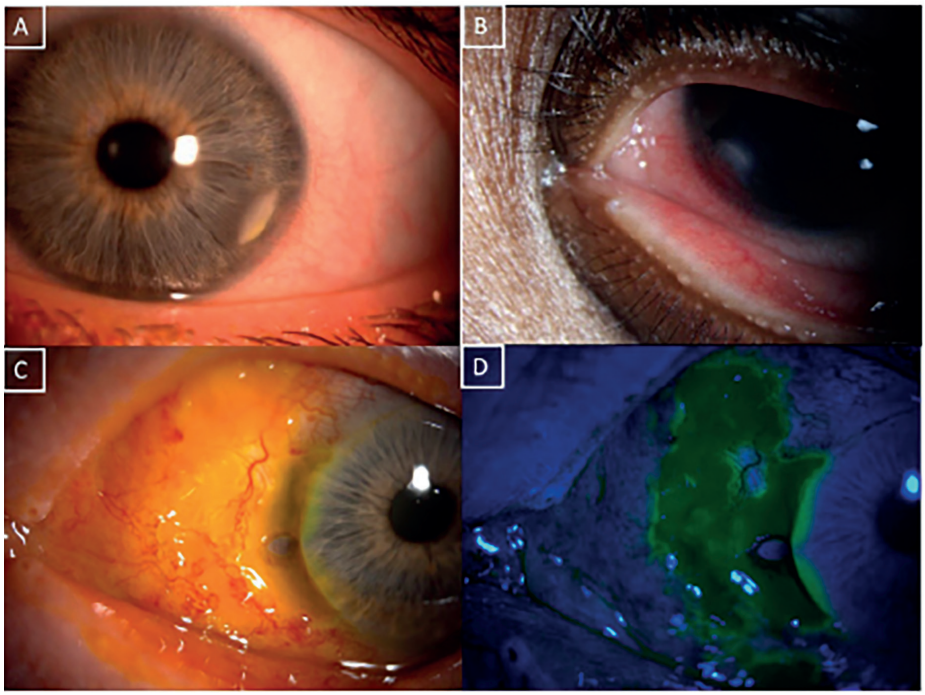


Figure 9.8 Peripheral corneal disease. (A) marginal keratitis; (B) phlyctenulosis; (C) peripheral ulcerative keratitis; (D) peripheral ulcerative keratitis (stained with fluorescein 2% and visualized with blue cobalt light).

- Referral to ophthalmology from non-ophthalmic services should be **within 24 hours if new presentation, or within 48 hours if the patient has a previous history**.

9.5.2 Phlyctenulosis

- Phlyctenulosis is also due to a staphylococcal hypersensitivity response, but is mostly found in children with a history of blepharokeratoconjunctivitis.
- The child may present with a history of pain (although many children will not complain of pain), photophobia and redness of the eye which remains despite treatment with topical antibiotics. These patients require **same day referral** to local eye services to prevent further involvement of the cornea, which can lead to further permanent reduced vision.
- On slit lamp examination, the phlycten can involve the conjunctiva, cornea or both. Corneal involvement normally exhibits grey nodules of the peripheral cornea, with superficial vascularization extending from the limbus to the cornea.
- Treatment involves aggressive lid hygiene and a combination of systemic antibiotics, with topical corticosteroids and artificial tears.

9.5.3 Peripheral ulcerative keratitis

- Peripheral ulcerative keratitis (PUK) is a sight-threatening form of peripheral corneal disease. It is often associated with systemic inflammatory conditions such as rheumatoid arthritis (RA; see *Chapter 21*) and granulomatosis with polyangiitis (GPA, a life-threatening condition; see *Chapter 21*).
- The patient presents with mild to moderate pain and reduced vision.
- Assessment of the area of epithelial and stromal thinning is best done under slit lamp visualization with fluorescein 2% (particularly looking for Seidel's sign).
- PUK must be considered in a patient with a painful red eye with a background of a systemic autoimmune / inflammatory disease.
- **Same day referral** to local emergency eye services.
- Patients need aggressive immunosuppressive treatment, which will often require the assistance of rheumatology colleagues.

9.6 Corneal graft

Corneal graft is a surgical technique used to improve the corneal surface, improving visual function. Diseased cornea is removed and replaced with donor cornea. A corneal graft can be full thickness (penetrating keratoplasty; *Figure 9.9*), lamellar (deep anterior lamellar keratoplasty, superficial anterior lamellar keratoplasty or endothelial keratoplasty, Descemet's stripping endothelial keratoplasty; *Figure 9.10*). If sutures are seen on the cornea, as in *Figure 9.9*, the patient is likely to have undergone either a penetrating keratoplasty or a deep or superficial anterior lamellar keratoplasty.

Patients who have undergone corneal graft are normally required to continue with topical corticosteroid eye drops long-term. Clinicians in primary care and A&E can help reiterate the importance of compliance for these patients, particularly when refills are requested through their GP, and when cornea service visits are only annual

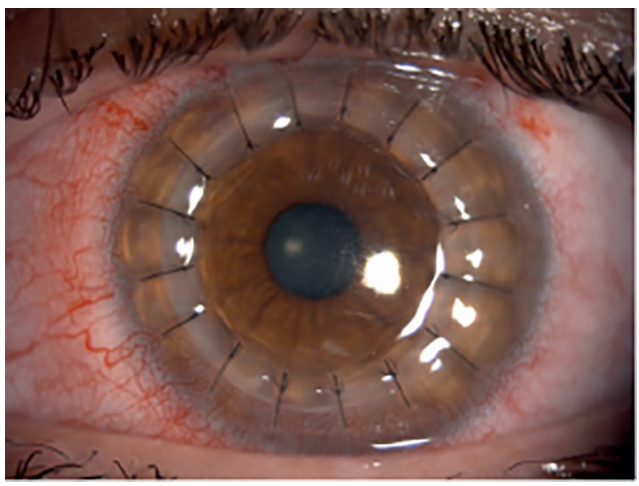


Figure 9.9 Penetrating keratoplasty.

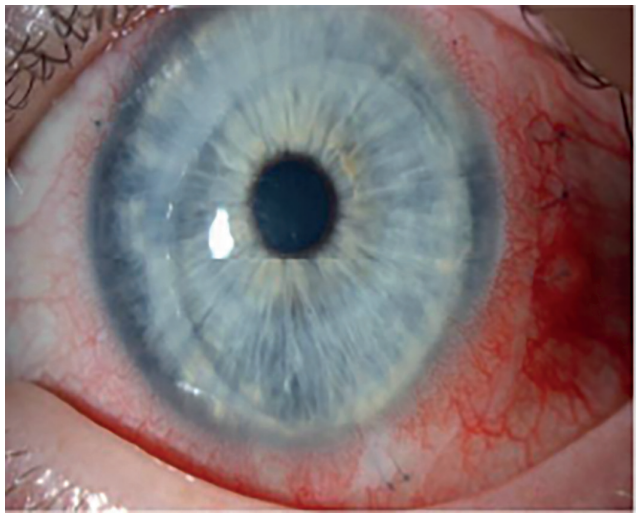


Figure 9.10 Descemet's stripping endothelial keratoplasty (DSEK).

because patients are clinically stable. Any query or concern with the use of long-term corticosteroid eye drops should be directed to the patient's cornea specialist, because stopping the medication puts the patient at risk of corneal rejection (*Figure 9.11*) or failure. *Table 9.3* gives a summary of the type of complications that can occur with corneal graft surgery.

Table 9.3 Corneal graft complications

Early complications	Late complications	Rejection
Wound leak Raised IOP Primary failure (corneal oedema that never resolves from day 1 post-op, non-immune-mediated) Endophthalmitis Persistent epithelial defect (duration >2 weeks)	Suture-related Microbial keratitis Late failure Disease recurrence in the graft	Immune-mediated response (unlike failure) Can be early or late Site-dependent • Epithelial • Stromal (subepithelial infiltrates) • Endothelial (corneal oedema, keratic precipitates, inflammatory demarcation line)

Treatment of suspected graft rejection is with aggressive topical corticosteroids in the first instance. It is imperative to **refer same day** to your local eye service if there is suspicion of this clinical presentation.

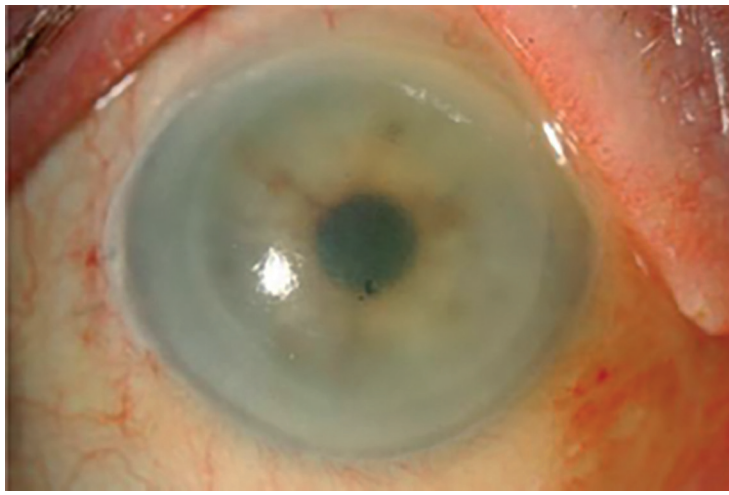


Figure 9.11 Corneal graft rejection in a patient who had a DSEK procedure.

RED FLAG

A patient presenting with a red, painful eye and photophobia on a background of a corneal transplant should be referred to eye services for same day review, due to the risk of infection, rejection or failure. It should never be treated as conjunctivitis in the community.

9.7 Corneal dystrophies

Table 9.4 illustrates the commonest dystrophies (a group of inherited, non-inflammatory, bilateral disorders) that can affect each layer of the cornea.

CLINICAL CONTEXT TIPS

What is recurrent corneal erosion syndrome?
Recurrent corneal erosion is a debilitating disorder caused by spontaneous breakdown of the corneal epithelium, often waking the patient at night. The patient often has a history of sharp trauma previously (think baby accidentally scratching the eye of parent), corneal dystrophies (see *Table 9.4*) or severe dry eye.

- The mainstay of treatment with acute presentation is aggressive use of artificial tears and cycloplegia
- Bandage contact lens with topical antibiotic cover can also be beneficial and applied in the ophthalmology setting
- Frequent episodes warrant referral to the cornea service for consideration of alcohol delamination of the epithelium.

Table 9.4 Common corneal dystrophies

Dystrophy	Inheritance and onset	Features	Treatment
Epithelium and Bowman's layer			
Epithelial basement membrane dystrophy (map-dot-fingerprint dystrophy) – most common	AD; early adulthood	Bilateral Asymmetrical Faint opacities Microcysts Curvilinear ridges Recurrent corneal erosions	Treat recurrent corneal erosion (see *Clinical Context Tips* below)
Reis–Bücklers	AD; early childhood	Bilateral Central reticular cloudiness of the cornea causing reduced vision Frequent episodes of recurrent corneal erosion	Treat recurrent corneal erosion (see *Clinical Context Tips* below) Laser keratectomy Corneal graft
Meesmann	AD; first year of life	Bilateral Intraepithelial cysts	Mostly asymptomatic
Stroma			
Lattice (most common)	AD	Bilateral Asymmetric Amyloid deposition Type I (commonest) only in the eye Type II familial systemic amyloidosis Type III occurs in patients of Japanese origin Filamentous / criss-cross lesions Recurrent corneal erosions	Treat recurrent corneal erosion (see *Clinical Context Tips* below) Laser keratectomy Corneal graft

Dystrophy	Inheritance and onset	Features	Treatment
Granular	AD	Bilateral Asymmetric White dots and stellate-like opacities with clear surrounding cornea Recurrent corneal erosions	Treat recurrent corneal erosion (see *Clinical Context Tips* below) Corneal graft
Avellino	AD	Bilateral Asymmetric Combination of lattice and granular dystrophy features Recurrent corneal erosions	Treat recurrent corneal erosion (see *Clinical Context Tips* below) Corneal graft
Endothelial			
Fuchs' endothelial dystrophy	AD or sporadic; gradual presentation with increasing age	Worsening vision, particularly in the morning Corneal guttata Stromal oedema Recurrent corneal erosions Stromal haze	5% sodium chloride to reduce oedema Bandage contact lens for comfort Corneal graft Risk of corneal decompensation with cataract surgery so important to counsel patient

AD, autosomal dominant.

9.8 Scleritis

The anatomy of the sclera is discussed in *Section 2.6*. Inflammation of the sclera can result from autoimmune inflammatory conditions or infection. Although scleritis is the inflammation of the tough fibrous coat of the globe (*Figure 9.12*), episcleritis is inflammation of a fibroelastic structure between the conjunctiva and the sclera. The main differences between episcleritis and scleritis in clinical presentation are:

- Pain: patients with scleritis are in immense pain (*"does the eye pain keep you up at night?"*)

- Redness: patients with episcleritis would have a bright red or pink colour to the diffuse or sectoral injection of the eye, whilst patients with scleritis have a darker red colour
- Tenderness: gentle palpation of the globe is not tolerated in patients with scleritis.

Management

See *Chapters 21* and *22*.

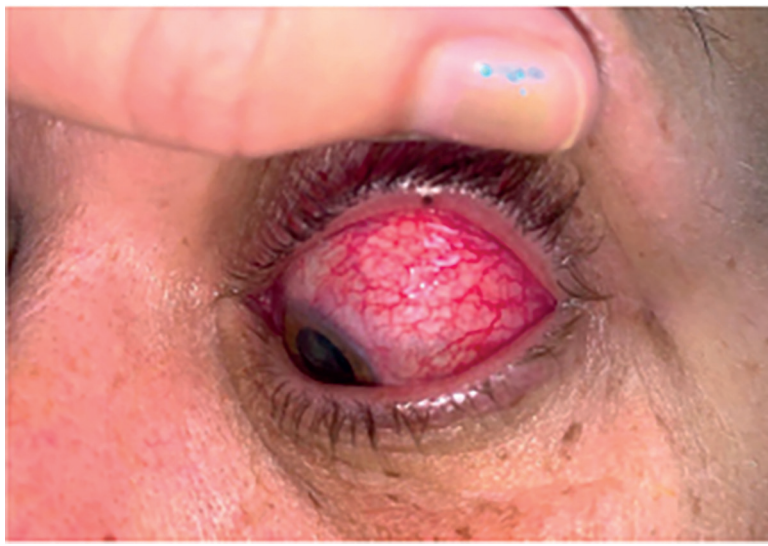


Figure 9.12 Scleritis.