MOS

Ready Reckoner

Dr. Santosh Bhide

Dr. Nikhil Gokhale

Dedicated to all our Respected Teachers who shaped our Academic career

Team MOS
Managing and Scientific Committee

Index

Preface

Dear MOS members

I would like to express my sincere gratitude for electing me as a President of MOS and giving me opportunity to serve our association

Theme for this year is Update to Upgrade

In keeping with the tradition, this year will also be academically enriching. The programs will be designed in a manner that will help all of us in upgrading our clinical skills

I would like to begin my tenure by presenting **MOS Ready Reckoner.** We have tried to select topics which are useful in our daily practice. I am sure this will definitely help us in decision making in management of challenging cases

I would like to thank Dr Nikhil Gokhale, Dr Quresh Maskati, Dr Sushmita Shah, Dr Aditi Watve, Dr Sumeet Lahane, Dr Vinay Agarwal, Dr Sapna Kini, Dr Ritika Dalal, Dr Suchismitha Behere, Dr Parul Deshpande, Dr Swapnil Bhalekar, Dr Pranav More, Dr Sangeeta Wagh, Dr Rohit Bang, Dr Ajay Kulkarni for their contribution

I would like to specially thank Dr Nikhil Gokhale for all his contribution during preparation of this manual.

I would like to thank Dr Bhupesh Bagga from LVPEI and Dr Geetha Iyer from SN for giving permission to use scientific literature in this manual

Since this is the first attempt in creating such manual, I know that there can be some shortcomings. Your feedbacks will be of great help for improvement in future and will also encourage all of us

I hope this manual will be of great help to all members of MOS. This will also be made available on our website of MOS

I would also like to thank Dr Shipa Patil, Team NOA & Mr Salunkhe from **Concept plus Nashik** for their help in printing this manual at a short notice

Dr Santosh Bhide
President MOS 2022-23

Foreword

I thank Dr. Santosh Bhide, President Maharashtra Ophthalmological Society (2022-23) to give me this opportunity in compiling the articles for the Cornea Ready Reckoner. We made an effort to select topics that we commonly encounter in our busy clinics and sometimes find it difficult to decide how best to approach or manage or at times we don't recall the name or the dose of the medication instantly. We approached the best cornea specialists from our state who were kind enough to spare their valuable time and compile information on various topics. We have prepared a soft and a hard copy which will be widely circulated. I am sure our members will appreciate the work and find it useful in practice. Since it was done in a short time and is the first effort in this direction there are bound to be some shortcomings or errors. We would request readers and members to inform us about the same if any. We would be happy to have feedback (appreciation or criticism) and on how we can make it better and more useful. Dr. Santosh Bhide has decided to prepare retina, glaucoma etc. ready reckoners as well in the next few months and feedback can help him greatly.

Wishing You all a Very Happy Diwali and New Year.

Thanks,

Dr Nikhil Gokhale

01. Instruction manual for Preparation of fortified antimicrobial eye drop

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Aminoglycosides

1. **Fortified Tobramycin: 14mg/ml(1.4%)**

Method: Add 2ml/80mg of parenteral to bramycin to commercially available to bramycin eye drops 0.3% 5 ml (15mg/5ml).

Shelf Life: 1 week in refrigerator at 4 degrees and 4 days in room temperature

2. **Fortified Gentamicin Eye Drops: 14mg/ml(1.4%)**

Method: Add 2ml/80mg of parenteral gentamicin to commercial gentamicin ophthalmic solution 0.3% 5 ml (15mg/5ml).

Shelf Life: 1 week in refrigerator at 4 degrees C and 4 days in room temperature

3. **Fortified Amikacin Eye Drops: 2.5%**

Method: Parenteral Amikacin 250mg/2ml is mixed with 8 ml artificial tears.

Shelf Life: 7 days under refrigeration at 4 Degrees Centigrade

Cephalosporins

1. **Fortified Cefazolin Eye Drops: 50mg/ml(5%)**

Method: Reconstitute parenteral Cefazolin 500mg with 2ml sterile water available with the injection and add to 8ml of artificial tears.

Storage: Refrigerate in 4 degrees C.

Shelf Life: 1week in refrigeration at 4 degrees C and 4 days in room temperature

2. **Fortified Ceftazidime eye drops: 50mg/ml(5%)**

Method: Reconstitute parenteral Ceftazidime 500mg with 2ml sterile water/BSS available with the injection and add to 8ml of artificial tears.

Storage: Refrigerate in 4 degrees C.

Shelf Life: 1week under refrigeration at 4 degrees C and 3 days in room temperature

Topical Vancomycin Eye Drops: 50mg/ml(5%)

Method: Reconstitute 500mg of vancomycin powder for injection with 2 ml sterile water/BSS. Add to 8ml of artificial tears.

Storage: Refrigerate at 4 Degrees C.

Shelf Life: 28 days at 4 Degrees C

Topical Linezolid 2 mg/ml (0.2%)

Method: Can use directly from parenteral Linezolid (Lancure / Adlid /Rapidline) available as 200mg/100ml (2mg/ml) IV infusion.

Topical Colistin 0.19%

Method: Prepared from parenteral Colistimethate sodium powder (Xylistin) 1million IU/75mg

Added to 10ml distilled water – 7.5mg/ml (0.75%)

1ml of above solution is then added to 3ml distilled water – 0.19% Colistin drops

Topical Imipenem–Cilastin eye drops 1%

Method: To parenteral Imipenem(500mg)-Cilastin (500mg), add 10ml sterile water to create a solution of strength 50mg/ml.

Take 1 ml of this solution and add 4 ml sterile water to make topical Imipenem 1% - 1mg/ml

Storage - In amber coloured bottles

Stability – 3 days at 2-8 deg C

Antifungals

Topical Amphotericin B 0.15%

Method: Add 10 ml distilled or sterile water to parenteral 50mg of amphotericin B powder for injection. Draw 3 ml of this and add to 7ml of artificial tears eye drops.

Storage: Refrigerate in 4 degrees.

Shelf life: 7 days in refrigerator at 4 degrees C and 4 days in room temperature.

Topical Voriconazole Eye Drops 1%

Method: Mix 20 ml ringer lactate to 200 mg voriconazole lyophilized powder.

Label: Voriconazole eye drops 1%

Stability: 30days at 4deg C or room temperature

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02. Reconstitution of Antimicrobial Drugs for Intrastromal and Intracameral Use

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Intracameral

Amphotericin B 5 -10 µgm/0.1ml for intracameral injection

To reconstitute 10 µgm/0.1ml :

Method: Reconstituted in BSS or sterile water

Add 10 ml distilled or sterile water to parenteral 50mg of amphotericin B powder for injection to prepare

5 mg/ml solution of Amphotericin B – take 0.2ml solution and add 0.8ml BSS / sterile water.

Now, take 0.1ml of this solution and add 0.9ml BSS/Sterile water to create 0.1mg/1ml

Amphotericin B equivalent to 10 µgm/0.1ml. Use immediately.

Voriconazole 50 µgm/0.1ml for intracameral injection

Method: Mix 20 ml ringer lactate to 200 mg voriconazole lyophilized powder to make 1% Voriconazole.

From 1% voriconazole solution, take 1ml, add 19 ml ringer lactate to make 0.05mg/ml(50µgm/0.1ml). Use immediately.

Intrastromal

Amphotericin B 5 -10 µgm/0.1ml for intrastromal injection

Method: Same concentration as is used for intracameral injection. Use immediately.

Voriconazole 50 µgm/0.1ml for intrastromal injection

Method: Same concentration as is used for intracameral injection. Use immediately.

03. Chemotherapy for OSSN

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Great advances in the management of OSSN have occurred with the development of numerous topical therapies. Recently, excision-based protocols are being replaced by topical chemotherapy in the form of reconstituted drops or intralesional (subconjunctival) injections, which may be used by itself or in combination with surgery.

Chemotherapy however is primarily for CIN (conjunctival intraepithelial neoplasia). For invasive OSSN (SCC), surgical excision is the treatment.

Points to notice while evaluating a case of OSSN:

1. Patient's age and medical history
2. Clinical and pathological features of OSSN: benign, CIN (precancerous), invasive SCC
3. Extent of lesion and invasion of fornix
4. Condition of ocular surface including corneal disease and severe dry eye
5. Patient's compliance
6. Patient's affordability

Indications of chemotherapy:

1. Noninvasive OSSN
2. Chemoreduction in cases with extensive surface involvement
3. Histopathologically positive margins after surgical excision

Available options for chemotherapy:

1. Interferon α2b (IFN α2b): topical drops/ subconjunctival/ combination
2. Mitomycin C (MMC)
3. 5 fluorouracil (5-FU)

Drugs with limited evidence:

1. Retinoic acid
2. Cidofovir
3. Anti VEGF drugs

OSSN chemotherapy drugs	Formulation	Dosage	Side effects
Interferon α2b	Topical: 1mIU/ml Subconjunctival: 3mIU/ml or 5mIU/ml	Subconjunctival: Monthly injections	Topical: 4 Topical: times a day Minimal side effects Subco-njunctival: flu like symptoms (malaise)
5 fluorouracil	Topical: 1% drops	4 times a day with 4 weeks of chemotherapy free interval before next cycle	Mild pain, for 4 weeks edema, epitheliopathy
Mitomycin C	Topical: 0.04% drops	4 times a day week for 4 weeks : 3-4 cycles	Pain, for 4 days a keratopathy, punctal stenosis, LSCD

Choice of for topical therapy- maximising efficacy/ minimising toxicity

Parameters	MMC 0.04%	5FU 1%	IFN alpha2b 1mlu/ml
• Compliance	• 4/d-1w/1w	• 4/d-1w/1w	• 4/d daily
• Refrigeration	• Yes	• Yes	• Yes
• Stability	• 15 days	• 15-30 days	• 30 days
• Rapid resolution	• Yes	• Intermediate	• Slow
• Toxicity	• Yes	• Intermediate	• No
• Daily dosing	• 1 week	• 1 week	• Daily
• Length of holiday	• 1 week	• 3 week	• Daily dosing
• Success rates	• 85-100%	• 82-100%	• 82-100%
• Cost	• 170 x3=510	• 30 x4=120	• 800 x4x6=19200
• MOA	• All phases of cell cycle	• S phase of cell cycle	• Via immunomodulation
• Mean time	• 2-3 cycles	• 4 cycles	• 3.5-4 months

TOPICAL THERAPY @ Sankara Nethralaya							
Choice of Agent - MMC/5FU/IFN							
Number of cycles (MMC/5FU)= / Duraion of treatment IFC = months							
MMC 0.04%	DOS DOT	5FU1%	DOS DOT	IFN1mu/ml	DOS DOT	Complete Clinical Resolution	Plan Change& Reason/ Comment
1st cycle-W1		1st cycle-M1		M1			
SOR	Yes/No	SOR	Yes/No	SOR@1M	Yes/No		
2nd cycle-W3		2nd cycle-M2		M2			
SOR	Yes/No	SOR	Yes/No	SOR@2M	Yes/No		Shift from if N to MMC no response
3rd cycle-W5		3rd cycle-M3		M3		Yes	
SOR	Yes/No	SOR	Yes/No	SOR@3M	Yes/No		
4th cycle-W7		4th cycle-M4		M4			
SOR	Yes/No	SOR	Yes/No	SOR@4M	Yes/No		
5th cycle-W9		5th cycle-M5		M5			
SOR	Yes/No	SOR	Yes/No	SOR@5M	Yes/No		

SOR - signs of resolution/ DOS-date of starting/ DOT- date of terminating/ W-week/ — month
Change the week(eg: W5 to W6) in case duration of drug holiday extended

04. Diagnostic Tips & Dilemma in OSSN

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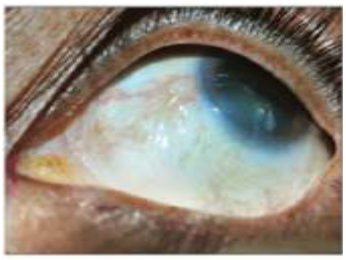
Pseudoepitheliomatous hyperplasia

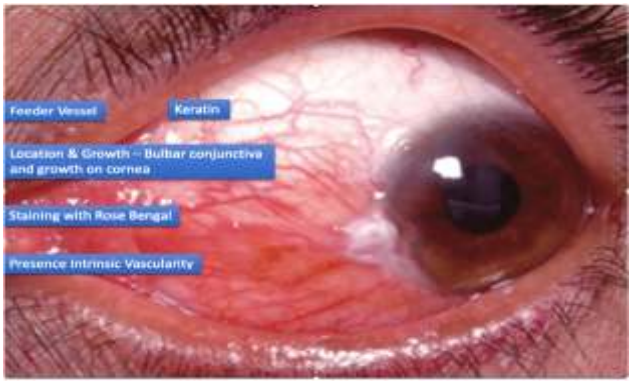


Actince Keratosis

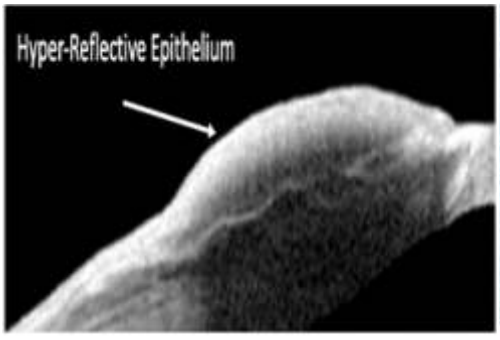
OSSN

How not to miss OSSN clinically

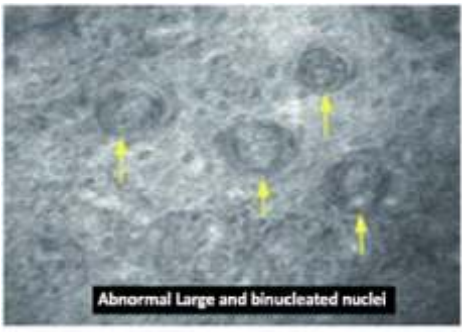
Presence of all clinical signs makes clinical diagnostic reliability upto 97 %



Ocular investigations to aid in diagnosis



Anterior Segment OCT



Confocal Microscopy

05. Management of Chemical Burn

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Stage (Days)	Suggested Intervention
Immediate 101	Prehospital: - - Start irrigation with any available clean solution as soon as possible* -hypertonic amphoteric solutions may be more beneficial Hospital: - - Rapid assessment: - Remove any particulate material: lid eversion (even double eversion) may be necessary; - Continue copious irrigation- with frequent measurement of ocular surface pH with litmus paper: - Once stable normal pH is achieved. reassessment on slit lamp and document the severity according to Dua classification *hypertonic amphoteric solutions may be more beneficial but patient discomfort is less with isotonic solutions
Acute (I-7) Reparative (8-21) throughout - classification	- Frequent topical corticosteroids irrespective of epithelial Early defects for at least 7 days - Continue corticosteroids if epithelialization has been completed - Start frequent preservative-free artificial tears and continue treatment - Start topical antibiotic (preservative-free formula is preferred) - Check 10P; start 10P lowering medcations if elevated 10P is detected. - Start systemic tetracyclines and vitamin C - Start biological medications (AS or PRP) in grades 111-V1 Dua classification - Consider AMT (alternatively: PROKERA) in grades IV-V1 Dua preferably in the first week - Consider Tenonplasty if scleral melting or ischemia is noted (more common in grades V-VI Dua classification) *In the presence of non-healing epithelial defects. steroids should be tapered after 10-14 days #Systemic agents may be preferred; Surgical interventions may be recuired in case of uncontrolled IOP
Late reparative (>21) failure movements	Treatment is directed at correction of complications: - Previous treatments are continued until stable ocular surface is ensured - DALK. PK. or KPro for visually debilitating stromal scars or endothelial - CLAU for unilateral LSCD: CLET. Ir-CLAL. and KLAL for bilateral LSCD - Symblepharon release with or without graft to restore external ocular - Forniceal and lid reconstruction

Abbreviations: 10P intraocular pressure: AS, autologous serum: PRP. platelet-rich plasma. AMT. amniotic membrane transplantation: DALK. deep anterior lamellar iceratoplasrf. PK. penetrating

keratoplasty. KPro. keratoprosthests: LSCD. timbal stern cell deficrenc-y-. °LAU conjunctival lrnbal autograft CLET. cultivated timbal epithelial transplarvtation: h.-CLAL living-related con,unctival lrnbal tograft: KLAL kerato-lurbal alkgraft.

Adapted from: Soleimani M, Naderan M. Management Strategies of Ocular Chemical Burns: Current Perspectives. Clin Ophthalmol. 2020;14:2687-2699

Grade	Clock Hours of Limbal Involvement	Bulbar Conjuctival Involvement	Analog Scale	Prognosis
I	0	0%	0/0%	Very Good
II	<3	<30%	0.1-3/I-29.9%	Good
III	>3-6	>30-50%	3.1-6/3I-50%	Good
IV	>6-9	>50-75%	6.1-9/5I-75%	Good to guarded
V	>9-<12	>75-<100%	9.I-II.9/75.I-99.9%	Guarded to poor
VI	12(total)	100%(total)	12/I00%	Very poor

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06. Antivirals - Prophylactic and Therapeutic Dosages in Adults and Children

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1. Herpes simplex keratitis

HSV Keratitis: Classification

A. Epithelial Keratitis:

Antiviral agents alone are the treatment of choice for HSV

Epithelial keratitis. Topical corticosteroids should be avoided in the initial management Of HSV epithelial keratitis.

i. **Dendritic ulcer: Therapeutic doses:**

Topical Treatment:

a) Topical aciclovir (ACV): Aciclovir 3% ointment
five times a day for seven days and then three times a day for seven days.
b) Topical ganciclovir (GCV): Ganciclovir 0.15%, 5 times daily until the ulcer has healed and then three times a day for seven days.

Systemic Treatment:

a) Acyclovir 400mg -3-5 times a day for 7-10 days or
b) Valacyclovir: 500 mg twice a day for 7-10 days or
c) Famciclovir: 250 mg twice a day for 7-10 days.

Debridement: Debridement alone is not recommended for the treatment of HSV epithelial keratitis. When antiviral agents are contraindicated or unavailable, debridement may be used as an alternative treatment. The addition of minimal wiping debridement to a topical antiviral agent may be of limited or no benefit.

ii. Geographic ulcer: Therapeutic doses:

Topical Treatment:

a) Topical Ganciclovir ointment 0.15%: 5 times daily until the ulcer has healed, then three times a day for seven days.
b) Topical Aciclovir 3% ointment: 5 times a day

Systemic Treatment:

a) Acyclovir 800mg -5 times a day for 14-21 days or
b) Valacyclovir: 1g thrice a day for 14-21 days or
c) Famciclovir: 500 mg twice a day for 14-21 days

B. Stromal Keratitis:

A topical corticosteroid agent in conjunction with an oral antiviral

agent for at least ten weeks is the preferred treatment for HSV stromal keratitis. The

balance between antiviral and corticosteroid therapy should be adjusted depending on

the presence or absence of epithelial ulceration.

i. Without epithelial ulceration:

Prednisolone 1%: 6-8 times a day tapered over greater than 10 weeks plus

Acyclovir 400mg -twice daily or

Valacyclovir: 500 mg once daily or

Famciclovir: 250 mg twice a day

As the disease comes under control, dose of prednisolone can be tapered slowly to the

Lowest possible dose and frequency depending on patient's clinical condition. The lowerthe dose and frequency of topical corticosteroid, the longer the interval between

Subsequent dose reduction. Oral antiviral agents in prophylactic doses (as mentioned above) should be maintained during corticosteroid treatment.

ii. With epithelial ulceration: Limited dose of topical corticosteroid plus therapeutic

dose of oral antiviral

Prednisolone 1%: twice daily plus

Acyclovir: 800mg -3-5 times a day for 7-10 days or

Valacyclovir: 1gm three times a day for 7-10 days or

Famciclovir: 500 mg twice a day for 7-10 days.

The oral antiviral agent is reduced to prophylactic dose and maintained as long as

topical corticosteroids are in use. As disease comes under control prednisolone can be tapered slowly.

Note: there is no clinical trial data to support a specific recommendation for length of treatment.

C. Endothelial Keratitis:

Therapeutic dose of topical corticosteroid PLUS therapeutic dose of oral antiviral

Prednisolone 1%: 6–8 times daily plus

Acyclovir: 400 mg 3–5 times daily or

Valacyclovir: 500 mg twice daily or

Famciclovir: 250 mg twice daily

The oral antiviral agent is reduced to prophylactic dose after 7–10 days and maintainedas long as topical corticosteroids are in use. As disease comes under control, the topical corticosteroid can be tapered slowly. Note: there is no clinical trial data to support

a specific recommendation for length of treatment.

Topical corticosteroid options

i. Fluorometholone 0.1% ophthalmic suspension
ii. Rimexolone 1% ophthalmic suspension
iii. Prednisolone Sodium Phosphate 1% ophthalmic solution
iv. Prednisolone Acetate 1% ophthalmic suspension
v. Difluprednate 0.05% ophthalmic emulsion

07. Keratoconus Mangement

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Screening for early detection: Children with VKC, eye rubbing, astigmatism above 2D Frequent change in glasses Syndromes associated with KC, family history of KC **Retinoscopy, refraction, corneal topography**

Confirmed Keratoconus(KC)

Age <18Y
High risk for progression
Closer follow up 3-6m
Low threshold for CXL
(Prefer Dresden protocol)

Age >18Y
6monthly follow up
CXL if progression on topography

KC detected during pregnancy: Observe, CXL after delivery and lactation

Planning pregnancy: Can offer CXL before pregnancy

KC

Progression/ High risk for progression → CXL
if BCVA satisfactory with glasses/CL

If no progression- Then observe → If CL intolerant/ suboptimal BCVA

TPRK/ICRS/CXL Plus procedures based on pachy cutoffs.** Stromal augmentation in thinner corneas <400□ in selected cases

DALK followed by spectacles/CL

PKP if significant scar in visual axis

Well accepted CXL protocols till date

Epithelium off with Riboflavin soakage time 30 minutes followed by

Dresden Protocol: 3mW/cm² for 30 minutes,

Accelerated protocol: 9mW/cm² for 10 minutes

Total fluence UVA5.4 J/cm²

*HPMC based isotonic riboflavin to be preferred during CXL

(except in special situations)

Phakic IOL for visual rehabilitation:

For reducing burden of high myopia and astigmatism to some extent in select cases only, after ensuring stability of the cornea. Relatively central cones where spectacles are improving vision significantly.
*Cannot compare with CL vision

Progression: Topography: K max increase by >1D, Kmax-Kmin >1D, mean K >0.75D, along with Thinning of cornea >20 >and increasing posterior, anterior elevations in a cluster of points (Correlate with symptoms, refraction change, >1D change manifest Cyl)
*Ensure healthy ocular surface during topography and same instrument during each scan while assessing progression.
ASOCT is better tool for pachymetry when in doubt, in post surgery and corneas with haze. Epithelial mapping useful tool along with topography for KC diagnosis.

Corneal hydrops: Observe with symptomatic care (or)
Compression sutures with non expansile gas mixture if large clefts on ASOCT or non resolving hydrops

Recent advances under evaluation:
Customized CXL methods, CXL supplemented with oxygen, Pulsed mode CXL, Corneal augmentation, Mini DMEK for corneal hydrops

Minimum accepted pachymetry (cut offs) and options**

>400µ for CXL(Dresden protocol, Accelerated protocol)

<400µ- CXL with adapted fluence based on minimum pachymetry, CL assisted CXL, Retaining small island of epithelium in thinnest area

(Ensure adequate pachymetry before irradiating with UVA)

>450µ forTopography guided PRK+CXL

(Aimed at regularizing the cone and improving part of the astigmatism. Maximum ablation<50µ).

Estimated post procedure minimum pachymetry should be 400µ for any CXL plus excimer laser

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08. VKC / Allergy

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IgE MEDIATED OCULAR ALLERGY	NON IgE Mediated OCULAR ALLERGY	
SEASONAL ALLERGIC CONJUNCTIVITIS (SAC)	ATOPIC KERAATOCONJUNCTIVITIS (AKC)	GIANT PAPILLARY CONJUNCTIVITI: (GPC)
PERRENIAL ALLERGIC CONJUNCTIVITIS (PAC)	VERNALKERATOCONJUNCTIVITIS	
VERNAL KERATOCONJUNCTIVITIS (VKC)		
ATOPIC KERATOCONJUNCTIVITIS (AKC)		

OCULAR ALLERGY

TYPES OF OCULAR ALLERGY

	SAC / PAC	VKC	AKC
DISEASE COURSE	SEAONAL SUMMER AND SPRING PERENNIAL - ALL THROUGHOUT YEAR	CHRONIC WITH ACUTE EXACERBATIONS USUALLY SUBSIDE BY 20 25YRS OF AGE	LATEONSET> 20-30YRSOF AGE, BUTPERSISTS THROUGHOUTLIFE
ALLERGEN	AIRBORNE POLLEN OR DUST(SEASONALOR PERENNIAL)	ENVIRONMENTAL ALLERGEN	ENVIRONMENTAL ALLERGEN
MECHANISM	TYPEI HSREACTIONIGE MEDIATED IMMUNE RESPONSE)	MIXED - TYPEIIGE MEDIATED ANDDELAYED TH2TYPE HYPERSENSITIVITY	MIXED -TYPE I IGE MEDIATED AND TH1TYPEIV HS REACTION
SYMPTOMS	ITCHING, REDNESS	ITCHING, REDNESS, ROPY DISCHARGE	ITCHINGREDNESS,SKIN COMPLAINTS
SIGNS	CONJUNCTIVAL CONGESTION AND CHEMOSIS , MILD PAPILLARY REACTION	GIANT PAPILLAE , LIMBAL HYPERTROPHY, HORNER TRANTA DOTS	EYELID SWELLING, MILDTO MODERATE CONJUNCTIVAI CONGESTION, CONJUNCTIVAL SCARRING WITH SYMBLEPHARON
CORNEALINVOLVEMENT	RARE	COMMON	COMMON

LABORATORY TESTS

DIAGNOSTIC TESTS	SAC , PAC , VKC AND ATOPY	REMARKS
SKIN PRICKTEST OR RASTTEST(BLOODIGE ANTIBODIES TOSPECIFIC ANTIGEN	ASSOCIATED WITH SYSTEMIC ALLERGYOR ATOPY OR PERSISTENT AND SEVERE DISEASE	FALSENEGATIVE RATE OF APPROXIMATE 45% ESP INNONIGE MEDIATED ALLERGIC DISEASE RESPONSEINVKC
CONJUNCTIVAL SCRAPINGS OR TEAR EVALUATION	PRESENCE OF EOSINOPHILS OR EOSINOPHILIC GRANULES IS DIAGNOSTIC.	ABSENCE DOESNOT RULEOUT DIAGNOSIS

Treatment

SAC OR PAC	
SYMPTOMATIC TREATMENT	ANTI HISTAMINICS (DUAL OR MULTIPLE ACTION)
COLDCOMPRESS	SHORT PULSES OF TOPICAL STEROIDS
AVOIDANCE OF ALLERGENS	RARELY IMMUNOTHERAPY IN SEVERE CASES

VKC OR AKC				
MILDDISEASE	MODERATE INTERMITTENT	MODERATE CHRONIC	SEVERE	BLINDING OR COMPLICATED
SYMPTOMATIC TREATMENT	ALLOF MILDDISEASE	ALLOF MODERATE INTERMITTENT	ALLOF MODERATE CHRONIC	ALLOF SEVERE
ANTI HISTAMINICS WITHMASCTCELL STABILIZING AGENTS (OLOPATADINE, BEIPOTSTIN , ALCAFATDINE)	TOPICAL CYCLOSPORINE OR TACROLIMUS	TOPICAL CYCLOSPORIN OR TACROLIMUS	ORALSTEROIDS SUBLINGUAL IMMUNOTHERAPY USEOF AIR PURIFIERS	ORAL IMMUNOMODULATOI THERAPY

VKC OR AKC				
SHORT PULSES OF LOWPOENCY SURFACE ACTING TOPICAL STEROIDS (LOTEPREDNOL OR FLUROMETHALONE)	SHORT PULSES OF TOPICALSTEROIDS OR LONGDURATION INTERMITTENT DOSE OF STEROIDS	MAINTENANCE CONTINUOUS THERAPY WITH DOSESTEROIDS LOW INTERMITTENT POTENTTOPICAL STEROIDS	SUPRATARSAL STEROIDS	SHIELDULCER SUPERFICIAL KERATECTOMWITH AMNIOTIC MEMBRANE UTCPAPILLAE EXCISIONWITH MMG LIMBALSTEM CELL TRANSPLANT ASSOCIATED GLAUCOMA OR CATARACT SURGERY

ANTIHISTAMINICS	MECHANISM OF ACTION	AVAILABLE AGENTS
PURE ANTIHISTAMINICS	HISTAMINERECEPTORBLOCKAGE	ORALCETRIZINE TOPICALNAPHAZOLINE LEVOCABASTINE
COMBINED MECHANISM		
ANTI HISTAMINICWITH MASTCELL STABILIZER	H1 RECEPTOR BLOCKAGE PREVENTS MAST CELL DEGRANULATION	OLOPATADINE KETOTIFEN BEPOTASTINE ALCAFTADINE
ANTI HISTAMINIC WITH ANTI INFLAMMATORY	H1 RECEPTOR BLOCKAGE PREVENTS RELEASE OF INFLAMMATORY MARKERS	EPINASTINE AZELASTINE KETOROLAC WITH OLOPATADINE COMBINATION

09. Management of Pseudo phakic corneal oedema

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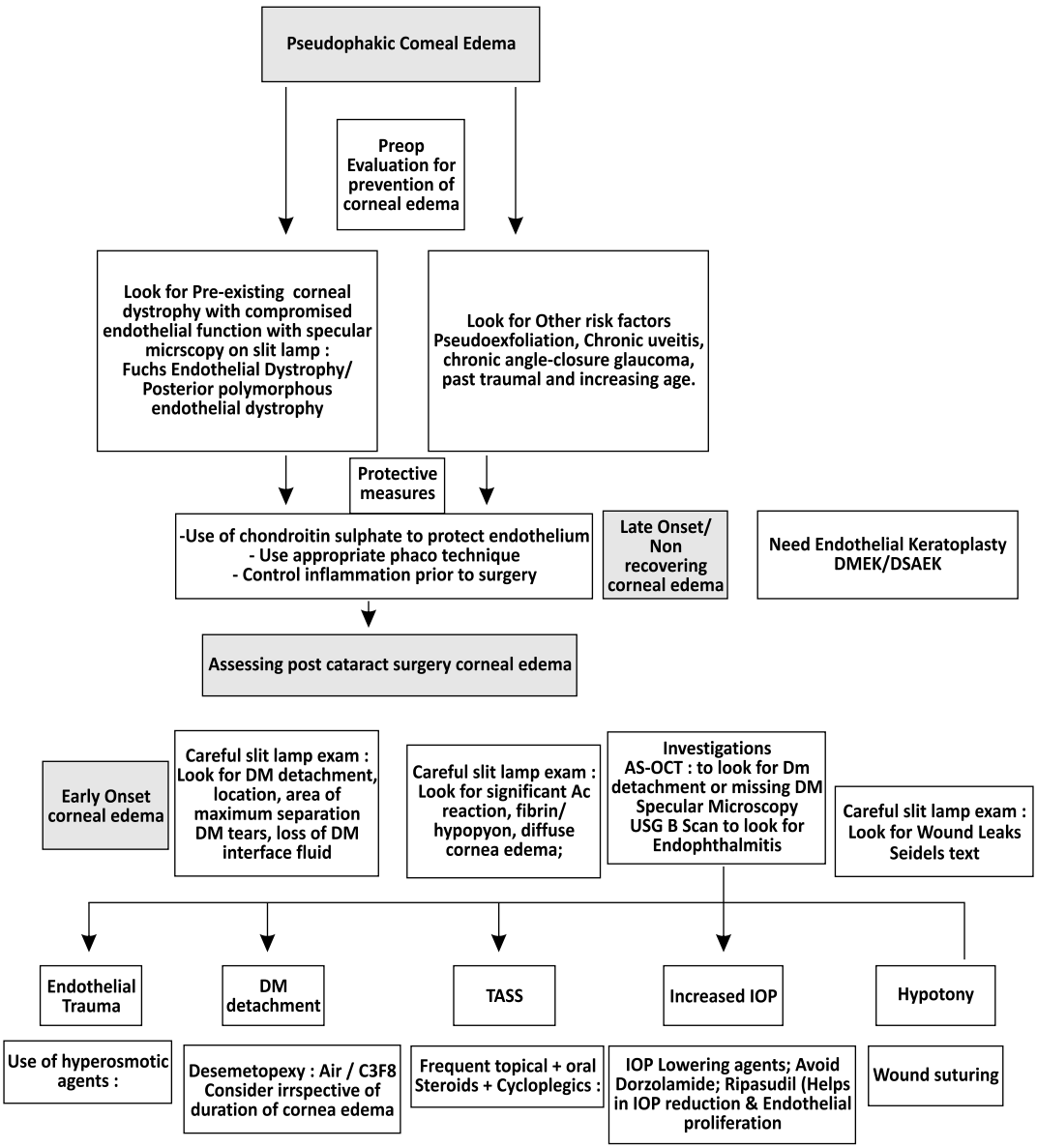
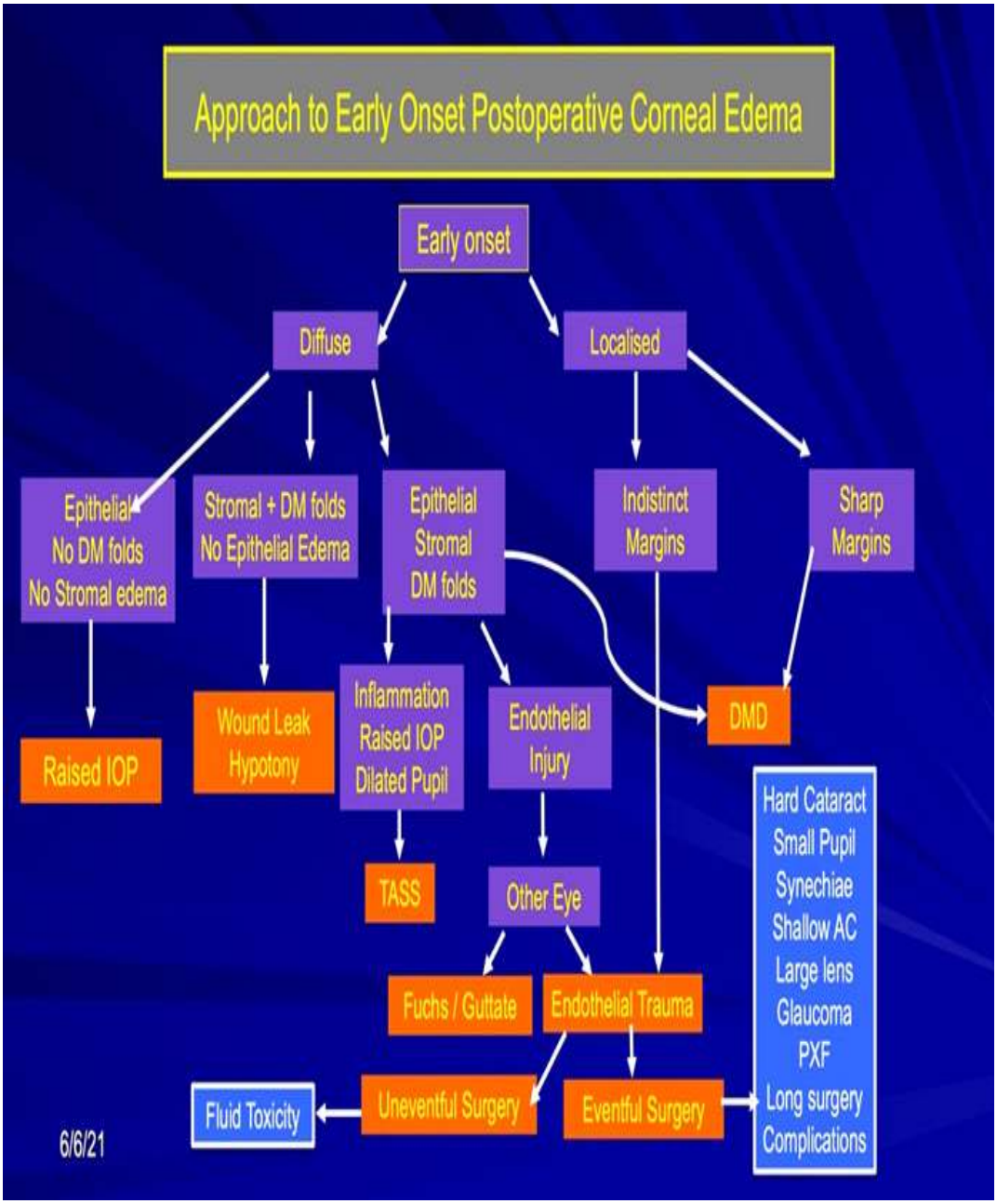


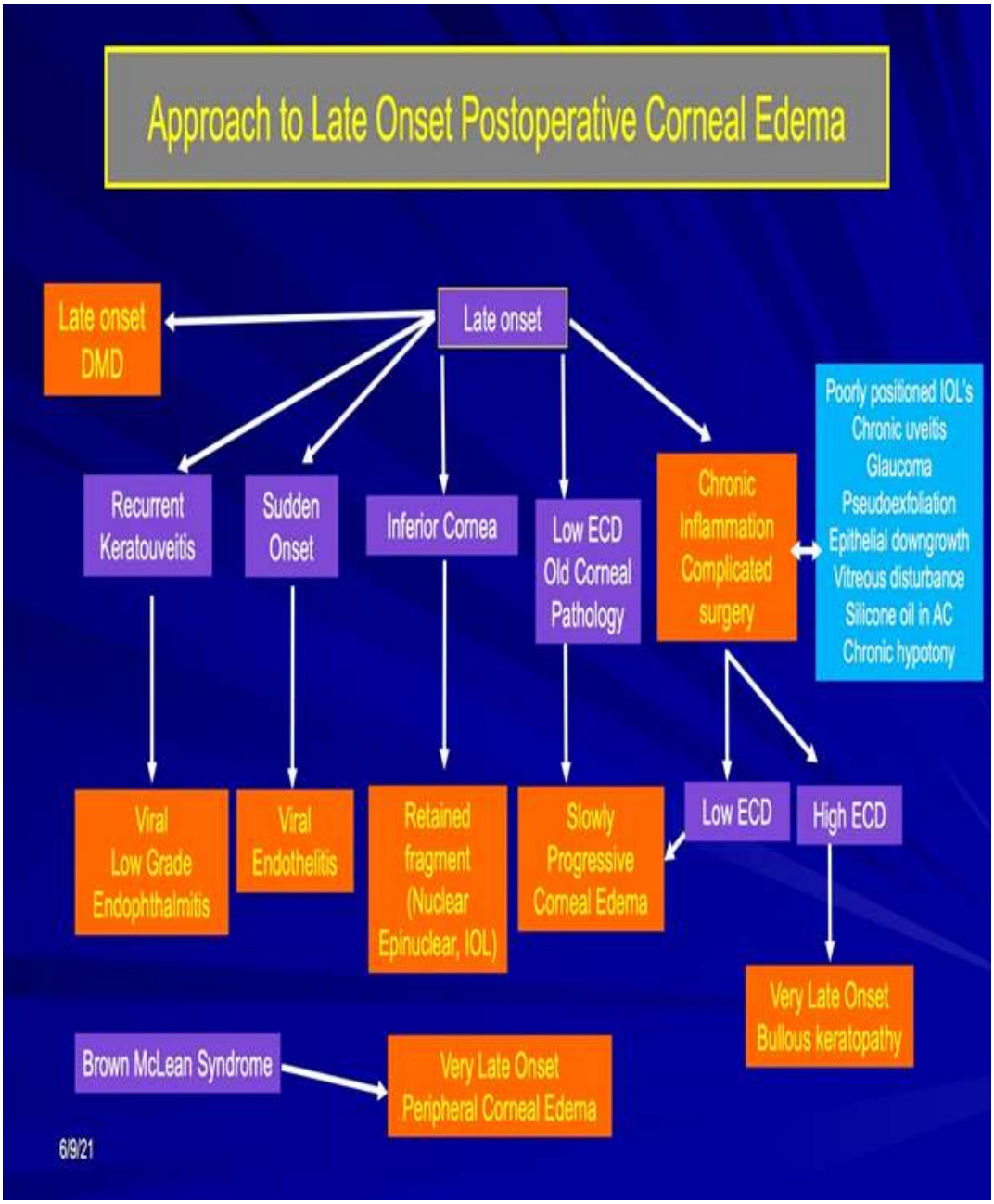
10. Approach to Early onset Postoperative Corneal Oedema

Dr Nikhil Gokhale, Mumbai
Cell : 9820154362 Email : niksgokhale@gmail.com



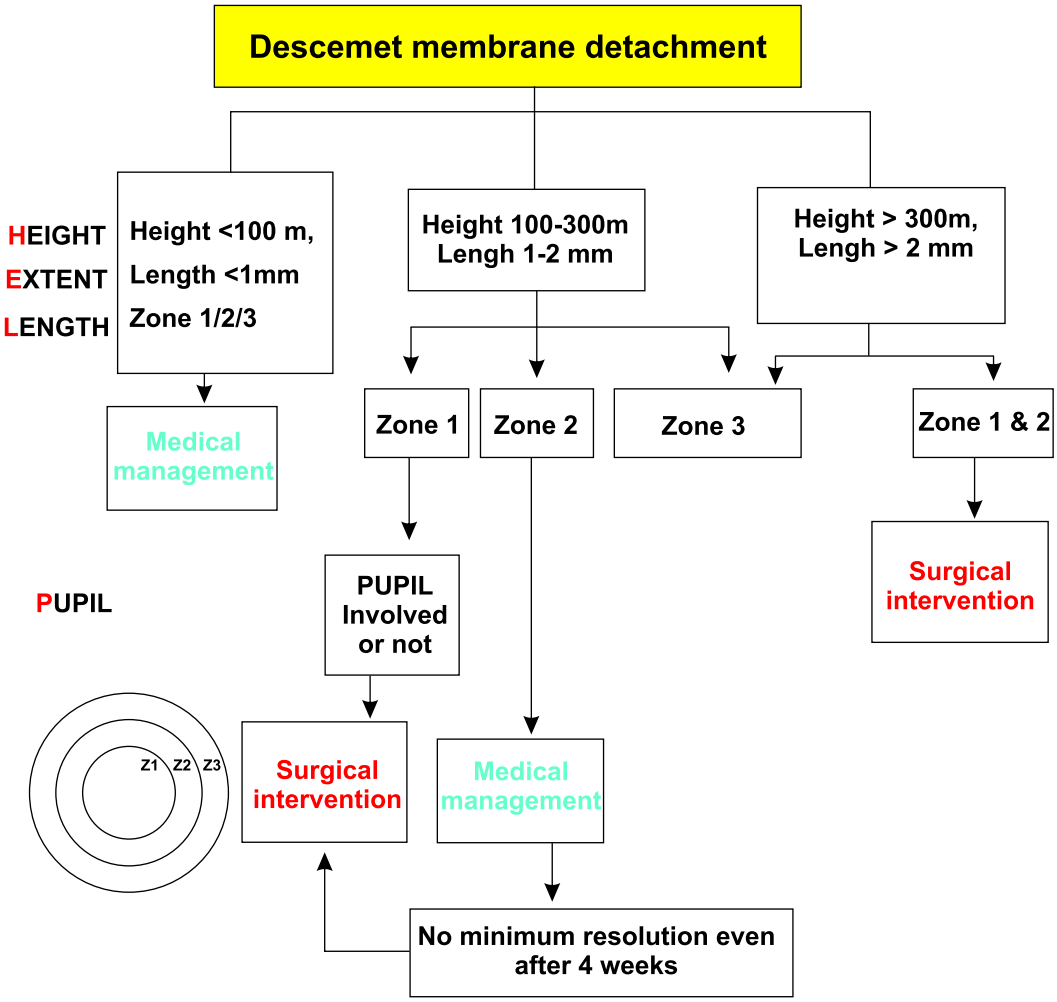
11. Approach to late Onset Postoperative Corneal Oedema

Dr Nikhil Gokhale, Mumbai
Cell : 9820154362 Email : niksgokhale@gmail.com



12. DM Detachment management post cataract surgery

Dr Rohit Bang, Aurangabad
Cell : 9657655211 Email : drrohitbang@gmail.com



References:

1. Munir et al Cornea Journal June 2016

13. Management of punctate epithelial erosions

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Diagnosis

Exam :Slit lamp examination to look for punctate epithelial erosions (PEE) or superficial punctate keratitis (SPK) after staining with Fluoroscein Sodium and Interposing the Cobalt Blue Filter and when possible a Wratten Yellow filter. Illumination diffuse to see the grade and extent and slit beam to confirm the depth.

Grading	Depth	Extent
0: None	Immediate/Delayed.	Superior
1: 1 -20 SPK	No ne/ moderate	Inferior
2: 21 -40 SPK		Nasal
3: >40 SPK.		Temporal
4: Confluent		

Also look at the blink, lid closure, lid margins, upper tarsal conjunctiva and Corneal sensations Treatment

Etiology and treatment

LIDS	
Condition	**Treatment**
Poor blink	Blinking exercises
Lagophthalmos	Tarsorrhaphy
Entropion/ ectropion	Surgery
Trichiasis	Electrolysis
MGD	Warm compresses Doxycycline Lipiflow/IPL
Blepharitis	lid scrubs (tea tree oil)

Tear film	
Condition	**Treatment**
Aqueous deficiency	Tear conservation (punctal plugs) Tear replacement
Mucin deficiency	Cyclosporin Vit A drops
Lipid deficiency	Paraffinbased ointment CSA in olive oil

Conjunctiva	
Condition	**Treatment**
Bacterial Adenoviral Chlamydia	Antibiotc Conserve Sulphacetamide

Cornea	
Condition	**Treatment**
Infective Adenoviral Herpes Microsporidia	Antibiotic Acyclovir Valciclovir scraping

VKC/Allergic	Steroids-low dose CSA Mast cell stabilizers
Cicatrizing	Steroids CSA or tacrolimus MMG
Trauma /Toxic Chemical	Steroids Withdraw offending agent

Toxic Welding Medicamentosa	Topical steroids Removal of offending agent
Trauma	AMG Steroids Lubricants
Dystrophy	PTK Keratectomy

14. Management of Punctate Epithelial Erosions

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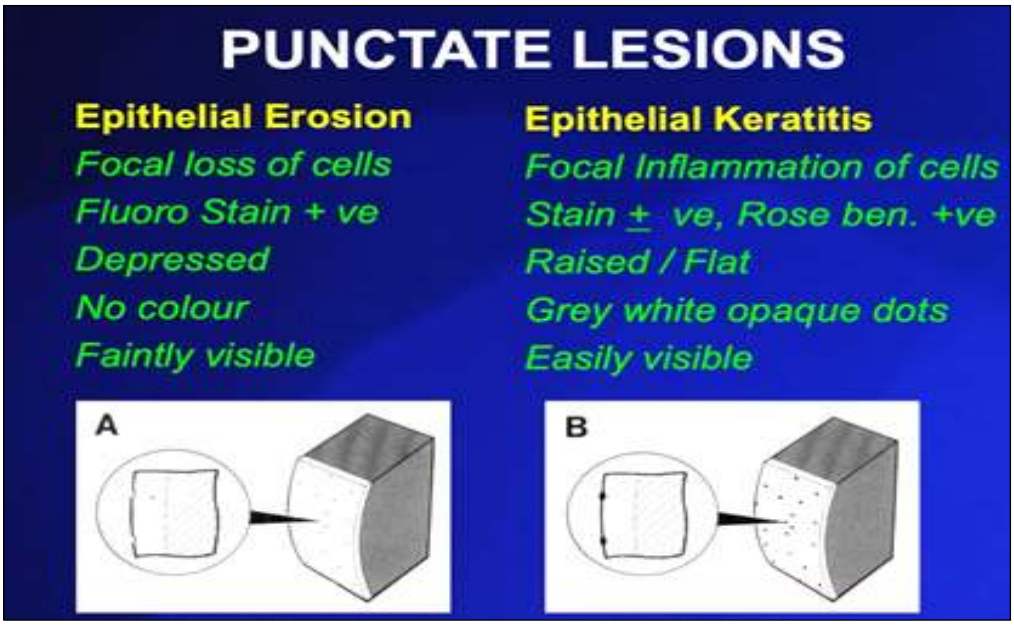
Diagnosis

Exam :Slit lamp examination to look for punctate epithelial erosions (PEE) or superficial punctate keratitis (SPK) after staining with Fluorescein Sodium and Interposing the Cobalt Blue Filter and when possible a Wratten Yellow filter. Use diffuse Illumination to see the grade and extent and slit beam to confirm the depth.

Also look at the blink, lid closure, lid margins, upper tarsal conjunctiva and Corneal sensations

Grading	Size	Extent
0: None	Fine	Superior
1: 1-20 SPK	Coarse.	Inferior
2: 21-40 SPK		Nasal
3: >40 SPK.		Temporal
4: Confluent		Diffuse

Picture A & B = Patterns of superficial keratopathy.



Roussel T, Grutzmacher R, Coster D. Aust J Ophthalmol. 1984 Nov;12(4):301-16.

Differential Diagnosis of Punctate Lesions Based on Location

Diffuse
Bacterial / Viral
Chlamydial
Severe dry eye
Rosacea
Medicamentosa
Vernal
Neurotrophic
Central
Contact lens overwear
UV light burns
Early Adenoviral

Inferior

Staph. Blepharitis
Exposure keratitis
Trichiasis / Entropion
Dry Eye

Superior

Sup. Limbic KC
Vernal KC Chlamydial
Molluscum contagiosum
Foreign body (Subtarsal)

Interpaplebral

KCS
Neurotrophic
Inadequate blinking
UV light burns

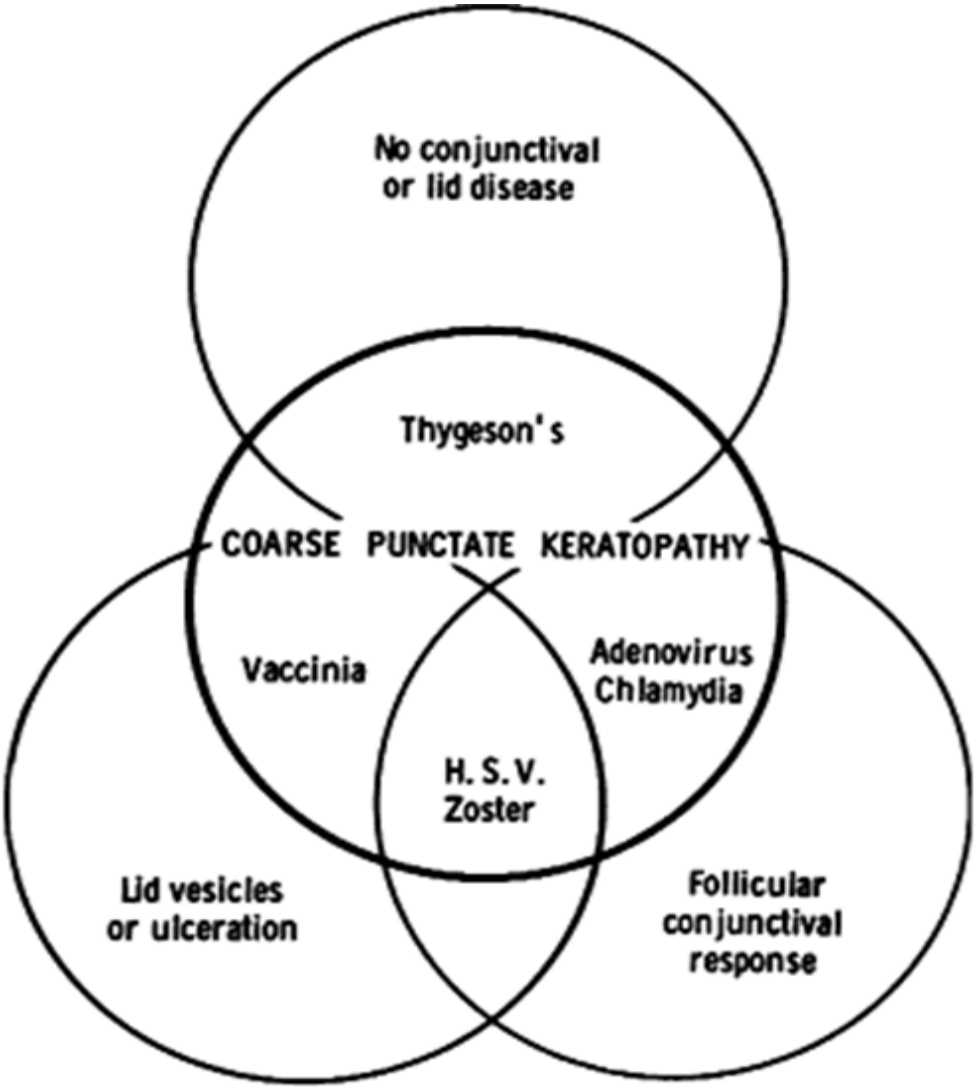
Zig Zag

Foreign body
Eye lash in the tarsal plate
Caterpillar hair

Punctate Keratitis

Fine Coarse .

Staph. Blepharitis	Adenoviral
Keratoconjunctivitis Sicca	HSV, HZV
Exposure keratitis	Vaccinia
Viral & Chlamydial keratoconjunctivitis	Microsporidial
Vernal keratoconjunctivitis	Chlamydial
Molluscum	Thygeson's



15. Management of Pterygium with Cataract

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Donald tan's grading

Grade 1 – Fibrovascular tissue reaching limbus

Grade 2 – Pterygium 2mm over cornea

Grade 3 – Pterygium Reaching pupil

Grade 4 – Pterygium Covering pupil

T 1 – Atrophic pterygium - episcleral blood vessels present under body of pterygium are clearly visible

T 2 - Intermediate pterygium – partially visible episcleral vessels

T 3 – Fleshy pterygium – episcleral vessels are completely obscured

what are effects of pterygium on surgical outcome of cataract surgery

1) Growth of pterygium on cornea leads to flattening of cornea in horizontal meridian leading to against the rule astigmatism (cornea gets flattened in the long axis of pterygium)

2) Advanced stage of pterygium causes irregular astigmatism

3) Pterygium removal causes significant changes in corneal curvature

Approach to coexisting cataract and pterygium

1) Grade 1 or atrophic pterygium can be tackled in same sitting or only cataract surgery can be performed

2) Grade 2 or more –

It needs two stage surgery.

stage 1 removal of pterygium

stage 2 cataract removal is done at least 4 to 6 weeks after pterygium removal or when 2 consecutive "K" readings are similar.

Conjunctival Autograft Is The Best Technique To Prevent Recurrence Of Pterygium

Bare Sclera Technique & Use Of Mitomic C Should Be Avoided

16. Flowcharts for Preparation of Betadine

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[2]Cell : 9820078357 Email : qureshmaskati@gmail.com

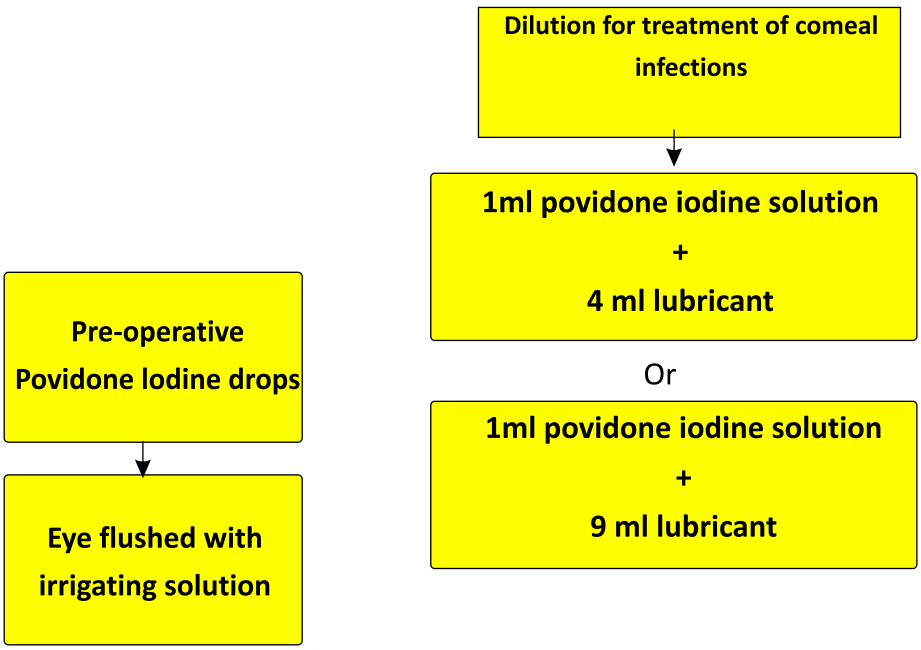
Povidone iodine eyedrops

5% povidone-iodine eye drops in the market are used preoperatively, after which the eye needs to be thoroughly flushed with irrigating solution.

To make povidone iodine eyedrops, we can take 1ml of povidone-iodine solution (not scrub) and add 4ml of lubricant.

Or

We can take 1ml of povidone-iodine solution (not scrub) and add 9ml of lubricant, depending on the concentration needed.



17. Preparation of Acetylcysteine drops For Filamentary Keratitis

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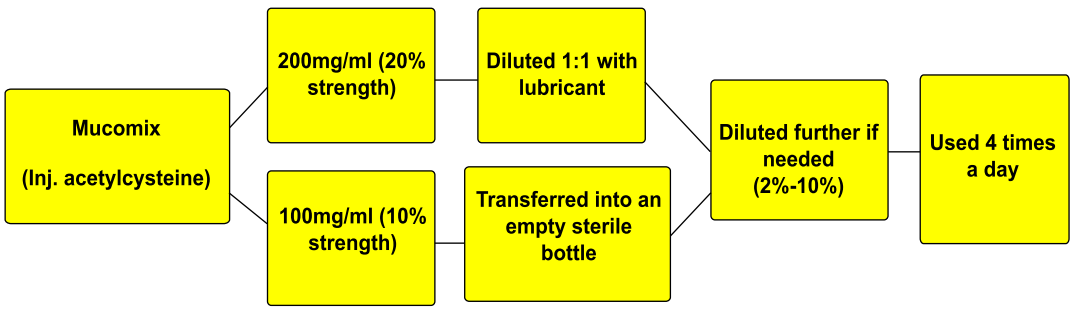
Inj. acetylcysteine (Mucomix) comes in 2 strengths - 100mg/ml and 200mg/ml i.e. 10% & 20% respectively (Drops used are usually 10 %.). So the 100mg/ml injection must be transferred into an empty sterile bottle. The 200mg/ml injection must be diluted 1:1 with a

lubricant and then dispensed. They are used 4 times a day. Some surgeons choose to dilute it further. Drops used have aconcentration from 2% to 10%, depending on patient tolerance and compliance.



18. Preparation of PHMB (Polyhexamethyl Biguanide) 0.02% eye drops for Acanthamoeba keratitis

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A.

Method 1: Add 5 microlitre of PHMB solution 20% in 5 ml of Lubricant using a micropipette (1:1000 dilution) Store at 4 degrees C.

Method 2: Add 0.1 ml of PHMB solution 20% to 100 ml commercially available pack of normal saline. This gives 0.02% solution. Transfer 10ml to 10 sterilized eye drop bottles.

B

Chlorhexidine Digluconate eye drops 0.02% for Acanthamoeba keratitis

Method 1: Add 5 microlitre of Chlorhexidine solution 20% in 5 ml of lubricant using a micropipette (1:1000 dilution) Store at 4 degrees C.

Method 2: Add 0.1 ml of Chlorhexidine solution 20% to 100 ml commercially available pack of normal saline. This gives 0.02% solution. Transfer 10ml to 10 sterilized eye drop bottles.

19. Bug Buster

LVPEI

TOPICAL PREPARATIONS

ANTIBIOTICS

	Name	Vial Size	Branch	Strength	Preparation	Refrigeration	Shelf Life	Spectrum
1	Vancomycin	500mg	Ancomycin Celovan Covancin	50mg/ml (5%)	"Reconstitute 500mg of vancomycin powder for Injection with 2 ml sterile water/BSS Add to 8ml of artificial tears"	4 degrees	1 week at 4 degree	Active against GPCs- MRSA,MDR Staphylococcus epidermidls
2	Cefazolin	500mg	Azolin Cefadin Cefacas	500mg/ml (5%)	"Reconstitute Parenteral Cefazolin 500mg with 2ml sterile water available with the injection and add to 8ml of artificial tears"	4 degrees C	1 week at 4 degree	GPC, GPB E Coil, Proteus H. influenza
3	Tobramycin	80mg/ 2ml	Alitop Bactob	14mg/ml (1.5%)	"Add 2ml/80mg of parenteral tobramycin to commercially available tobramycin eye drops 0.3% 5 m1 15mg/5ml)"	4 degrees	1 week at 4 degree	Aerobic Gram-negative Organisums
4	Gentamicin	80mg 2ml	Biogracin Garamax	14mg/ml (1.4%)	"Add 2ml/80mg of parenteral gentamicin to commercial gentamicin ophthalmic solution 0.3% 5ml (15mg/5ml)"	4 Degrees	1 week at 4 degree	Aerobic GNBs
5	Amikacin	250mg/ 2ml	Abm, Acil Acmacin	2.50%	Parenteral Amikacin 250mg/2ml is mixed with 8 ml artificial tears			Gram neg esp Pseudomonas Mycobacterium & Nocardia
6	Linezolid	200mg/ 100ml	Anzolid Linospan	2mg/ml (0.2%)	"Can use directly from parenteral Linezolid available as 200mg/100ml(2mg/ ml) IV infusion"			Aerobic GPC including MRSA and VRE
7	Ceflazidime	500mg	Afzid C-Zid	50mg/ml (5%)	Reconstitute 500mg of Cerftazidime powder for injection with 10 ml sterile water/BSS.	4 deg C	1week at 4 degree	Aerobic GNBs, GPBs including Pseudomonas
8	Imipinem	500mg	Cilanem Cilaspene	10mg/ml (1%)	"Top 500mg add 10ml sterile water Take 1ml of this Solution and add 4ml Sterile water"	4deg C	3 days at 4 degree	MDR GPB, GNBs including Psedomonas, therapeutic option for infections caused by MDR pathogens
9	Colistin	1 million IU (75mg)	Xylistin	1.9mg/ml (0.19%)	Reconstitute 1MIU(75mg) Colistimethate Sodium in 10ml sterile water. Draw 1ml of this and add 3 ml of sterile water	4 deg C	1 week at 4 degree	Gram negative bacilli and Multi drug resistant Pseudomonas & Acinetobacter

ANTI FUNGAL

	Name	Vial Size	Branch	Strength	Preparation	Refrigeration	Shelf Life	Spectrum
1	Amphotericin B	50mg	Amfotex Ambilip Amfitas	0.15%	"Add 10ml distilled or sterile water to parenteral 50mg of amphotericin B powder fr injection. Draw 3ml of this and add to 7ml of artificial	4 degrees	1 week at 4 degree	Yeasts, filamentous fungi (resistance reported Aspergillus)
2	Voriconazole	200mg	Voriva Voriz Vorce	1%	Mix 20ml ringer lactate to 200mg voriconazole lyphilized powder	4deg C	1week at 4 degree	Broad-spectrum activity against moulds and yeasts

ANTI PROTOZOAL

1	Cglorthexidine Digluconate	0.02%	Add smicrolitre ofchlorthexidine Digluconate solution(20% in water) in 5ml of Moisol using micropipippete (1:1000 dilution)	4deg C	1 Week at 4degree	Acanthamoeba
2	Polyhexamethy Biguanide (PHMB)	0.02%	Add 5microlitre of PHMB solution(20%) 5ml of Moisol using micropippete (1:1000 dilution)	4degC	1week at 4 degree	Acanthamoeba

SUBCONJUNCTIVAL DOSE

	S No.	Drug	Dose (mg)
	1	Vancomycin	25
	2	Cefazolin	100
	3	Tobramycin	10-20
	4	Gentamicin	10-20
	5	Amikacin	25
	6	Ceftazidime	100-200
	9	Voriconazole	10 (Not used)
	10	Amphotericin B	5-10

INTRAVITREAL PREPARATIONS

	Name	Vial Size	Branch	Strength	Preparation	Refrigeration	Shelf Life	Spectrum	Repeat Injection
1	Vancomycin	1mg/ 0.1ml	Ancomycin Celovan Covancin	500mg	Reconstitute 500mg of vancomycin powder for injection with 10 ml sterile water/BSS. Take 0.2ml of this soluction and make it 1 ml.	4 degrees C	24 hrs	Active against GPCs- MRSA, MDR staphylococcus epidermidis	72hrs
2	Cefazolin	2.25mg 0.1ml	Azolin Cefadin Cefaces	500mg	Reconstitute parenteral Cefazolin 500mg with 2ml sterile water. Take 0.1 ml of this solution and make it 1ml.	4 degree C	24 hrs	GPC, GPB E-coil Proteus, H. influenza	24hrs
3.	Amikacin	0.4mg 0.1ml	Abm. Acil Acmacin	100mg/ 2ml 500mg/ 2ml	From Parenteral Amikacin 100mg/2ml or 50mg/1 ml take .2ml and add 2.3ml sterile water From Parenteral Amikacin 500ng/2ml take 0.2 ml & add 6.15 ml sterile water	4 degrees C	24 hrs	Gram neg esp Pseudomonas. Mycobacterium & Nocardia	24-48hrs
4.	Gentamycin	0.2mg 0.1ml	Biogracin Garamax	800mg/2ml	Take 0.1ml solution from 2ml/80mg of parenteral gentamicin and add 1.9ml sterile water/BSS.	4 degrees C	24hrs	Aerobic GNBs	72-96hrs
5.	Amphotericin B	5µgm	Amfotex Ambilip	50mg	Add 10ml of 5% dextrose to parenteral 50mg of amphotericin B Powder Take 0.1 ml of this solution and add 0.9 ml of 5% dextrose in the solution	4 degrees C	24hrs	Yeasts filamentous fungi(resistance reported for various species of Aspergillus)	48hrs
6	Voriconazole	50-100µ gm 0.1ml	Voriva Voriz Voraze	200mg	Mix 20ml ringer lactate/ distilled water to 200 mg voriconazole lyophilized powder. Take 1ml of the solution and add 9 ml of RL/distilled water to it.0.05 ml of the solution has 50-100µgm/0.1ml	4 degrees C	24hrs	Broad-spectrum activity against moulds and yeasts	48hrs
7	Ceftazidime	2.25mg 0.1ml	Afzid C-Zid	250mgml 500mg/2ml	Take 0.1 ml solution from 250mg/ml or 500mg/2ml or parenteral ceflazidime and add 0.9 ml sterile water/ BSS.	4 degrees C	24 hrs	Aerobic GNBs GPBs including Pseudomonas	48-72hrs
8	Ciprofloxacin	100µgm 0.1ml	Alcipro	200mg/ 100ml	"Directly loaded from the sterile vial and injected intraviteality, 0.05ml"	Room Temp		"Broad spectrum activity against aerobic Gram-positive and Gram-negative bacteria Actinomyces Npcardia spp."	12hrs
9	Moxifloxacin	200µgm 0.1ml	Vigamox	Topical 0.5%	Take 0.05 ml of 0.5% moxifloxacin (Preservative free)	Room Temp		"Broad-spectrum activity against Gram-positive and Gram-negative organisms"	12hrs

INTRASTROMAL PREPARATIONS

1	Voriconazole	50µgm 0.1ml	"Form 1% Topical solution voriconazole take 1ml, add 19ml ringer lactate to make 0.05mg/ml (50µgm/0.1ml)"	To be Used immediately	Broad-spectrum activity against moulds and yeasts
2	Amphotericin B	5-10µgm 0.1ml	"Add 10mi distilled or sterile water to parenteral 500mg of amphotericin B powder from 5mg/ml solution take 0.2ml solution and add 0.8ml BSS / sterile water. Now, take 0.1ml of this solution and add 0.9ml BSS/Sterile water to create 0.1mg/1ml Amphotericin B equivalent 10µgm/0.1ml"	To be used immediately	Yeasts filamentous fungi (resistance reported for various species of Aspergillus)

INTRAVENOUS

S No.	Drug	Dose	Brands
1	Vancomycin	2g daily in 2 doses	Covancin, Cp-Van
2	Cefazolin	1-6g daily in 3-4 divided doses	Azolin, Cefadin, Ciprid
3	Tobramycin	3-5 mg/kg daily in 2-3 doses	Tobacin, Tobax
4	Gentamicin	3-5 mg/kg/ day In 2-3 in 2-3 divided doses	Alpagen, Avrocin
5	Amikacin	15mg/kg/day in 2-3 divided doses	Abcin, Abiox
6	Ceftazidime	2-6g daily In 2-3 divided does	Fortum, Megazid
7	Imipinem	2g daily in 3-4 divided doses	Cilanem, Cilaspene, Lastinem
8	Voriconazole	6mg/kg IV every 12 hours (24 hours) then 4 mg/kh x 12 hours or 200 mg/day BD	Voriva, Voriz
9	Amphotericin B	10-20 gm/ml infusion	Amfitas, Amfocare

20. Cyclosporin, Tacrolimus, MMC

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Cyclosporine eye drops

- Available commercially in0.05% and 0.1% strengths as suspension and 2% as emulsion
- Its an immunomodulator drug rather than suppressor
- It's a safe alternative for steroids in chronic ocular inflammatory conditions and
- Small daily dosing of 2 or 3 times in a day helps in compliance
- Preferred drug for maintenance esp. In allergic conditions and moderate to severe dry eye disease
- Onset of action takes about 2-3 weeks, hence needs an overlap with surface acting steroids for atleast 10- 15 days
- Its well tolerated however is known to cause stinging sensation on instillation, occasionally redness.
- No systemic side effects noted, avoid in children less than 4 yrs and also caution during pregnancy

Tacrolimus eye oint

- Quite a potent anti inflammatory drug esp in refractory conditions
- To be used as last reserve drug in ocular surface inflammatory disease not responding to conventional Rx
- Daily dosing of 2 or 3 times in a day helps in compliance
- 0.03% can be instilled in conjunctival fornix for ocular surface Rx

- 0/1 % should be applied over skin of the lids for Rx of refractory GPC
- Usually associated with significant irritation and burning on instillation and occasionally redness
- Avoid using in children less than 2 yr age and during pregnancy

MMC

- Quite a potent anti inflammatory drug esp in refractory conditions
- To be used as last reserve drug in ocular surface inflammatory disease not responding to conventional Rx
- Daily dosing of 2 or 3 times in a day helps in compliance
- 0.03% can be instilled in conjunctival fornix for ocular surface Rx
- 0/1 % should be applied over skin of the lids for Rx of refractory GPC
- Usually associated with significant irritation and burning on instillation and occasionally redness
- Avoid using in children less than 2 yr age and during pregnancy

21. Algorithm for management of bacterial keratitis

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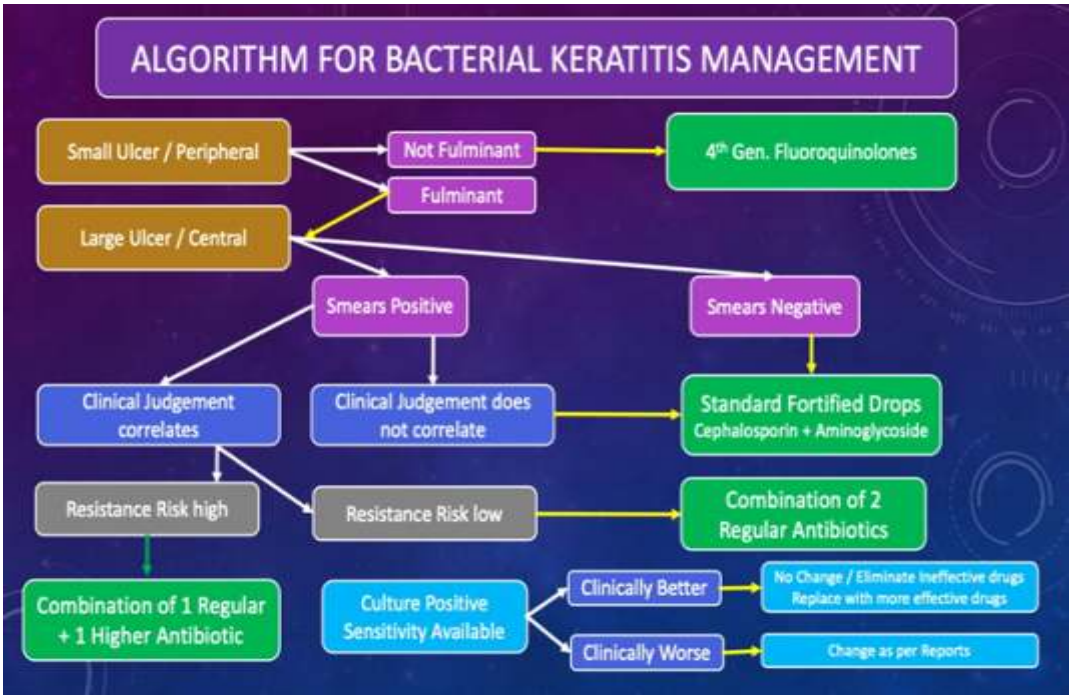
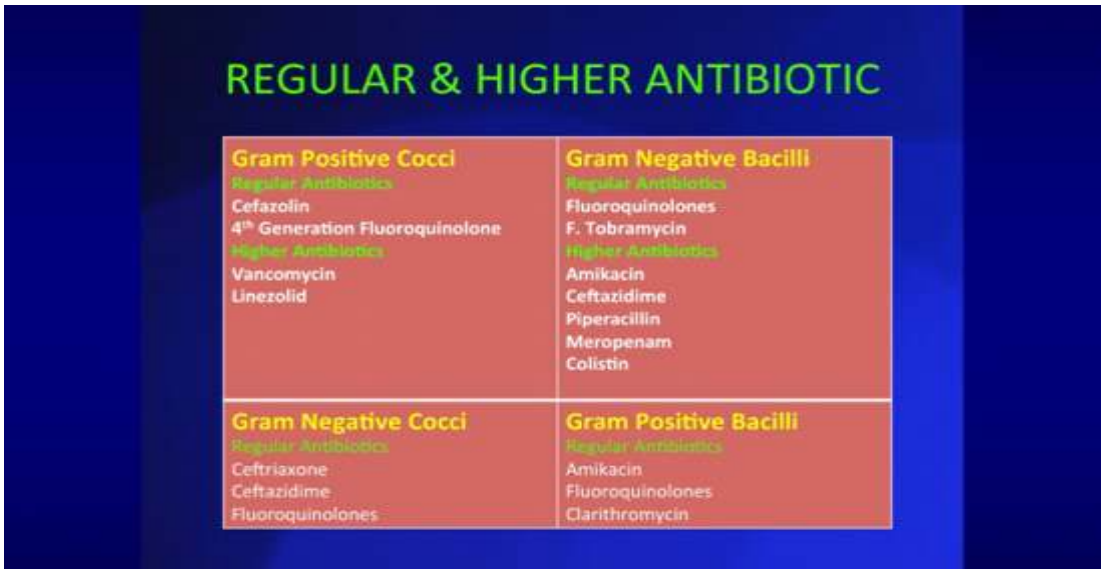
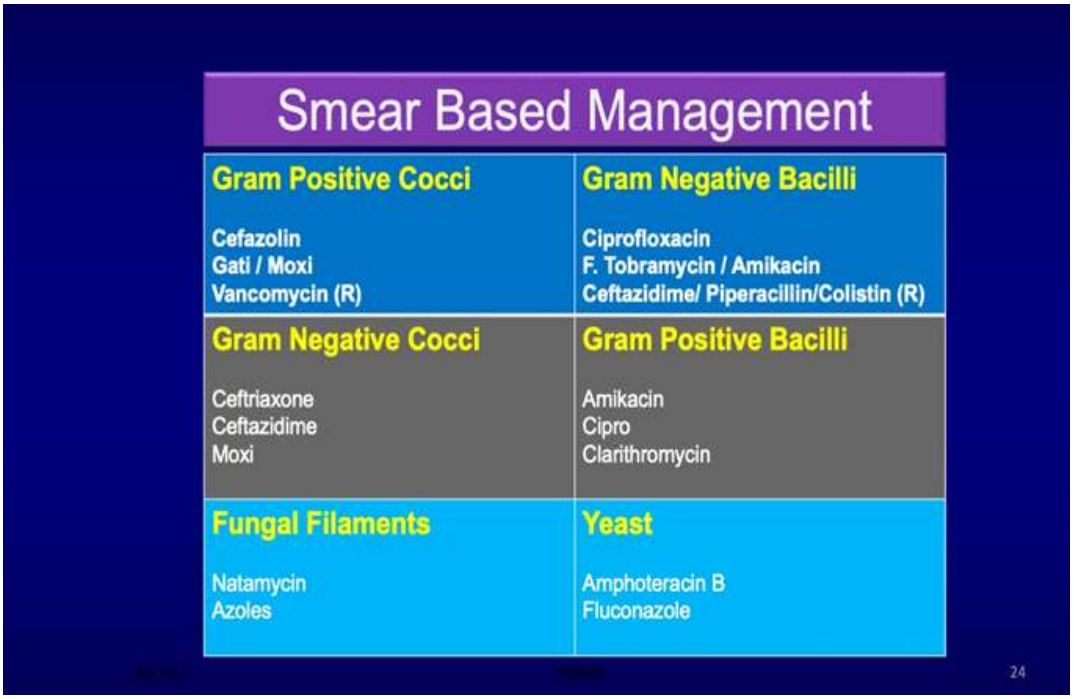
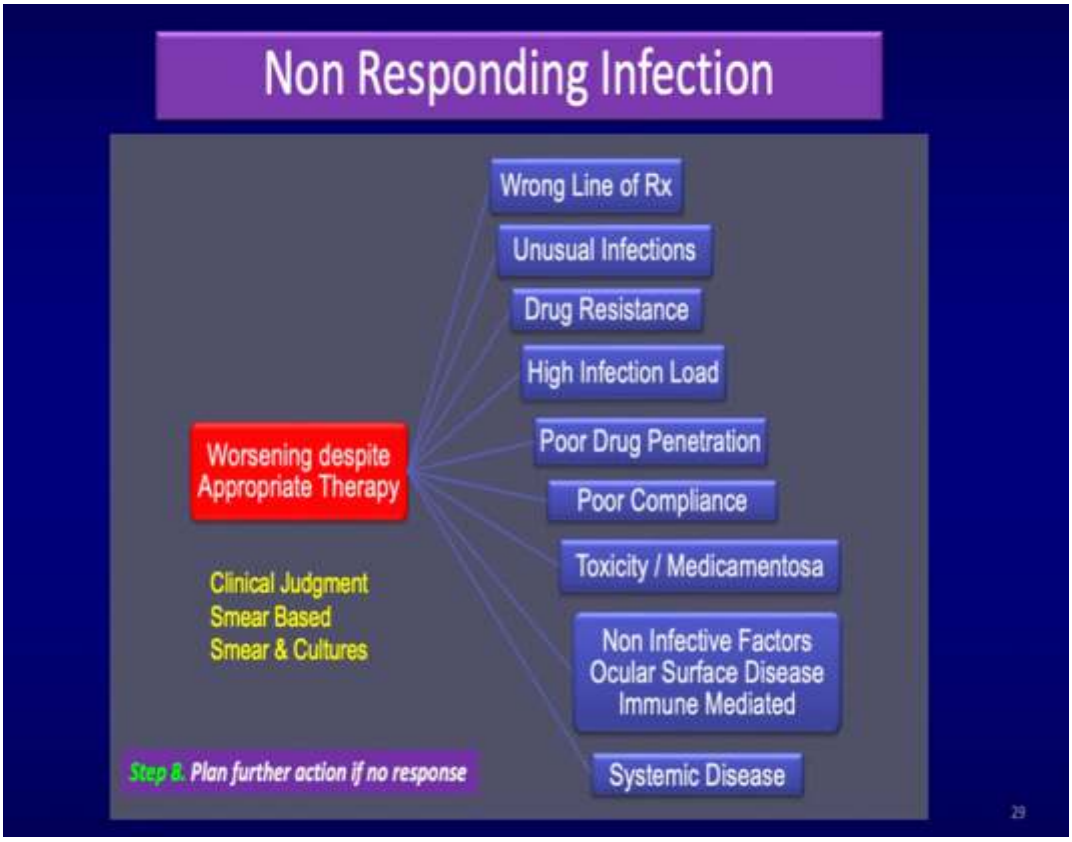





Smear Based Management
Gram Positive Cocci
Cefazolin
Gati / Moxi
Vancomycin (R)
Gram Negative Bacilli
Ciprofloxacin
F. Tobramycin / Amikacin
Ceftazidime/ Piperacillin/Colistin (R)
Gram Negative Cocci
Ceftriaxone
Ceftazidime
Moxi
Gram Positive Bacilli
Amikacin
Cipro
Clarithromycin
Fungal Filaments
Natamycin
Azoles
Yeast
Amphoteracin B
Fluconazole
24


Non Responding Infection
Worsening despite Appropriate Therapy
Clinical Judgment
Smear Based
Smear & Cultures
Wrong Line of Rx
Unusual Infections
Drug Resistance
High Infection Load
Poor Drug Penetration
Poor Compliance
Toxicity / Medicamentosa
Non Infective Factors
Ocular Surface Disease
Immune Mediated
Systemic Disease
Step 8. Plan further action if no response
29

22. Algorithm for management of fungal keratitis

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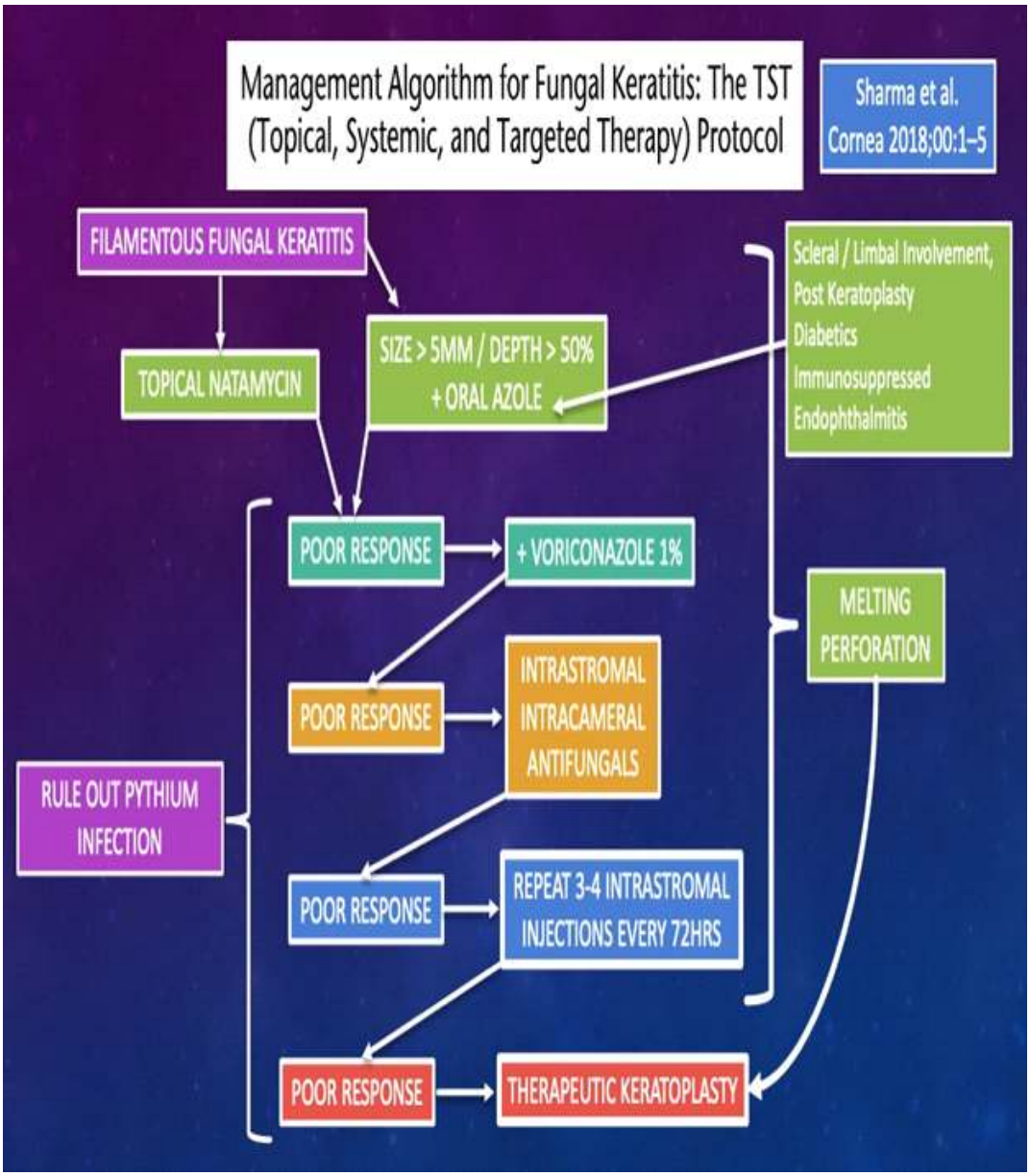

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