CLEARING THE PATH TO SUCCESSFUL CATARACT SURGERY:
THE CRUCIAL ROLE OF EVALUATING AND TREATING DRY EYE

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GOALS

1. Understand the impact of dry eye on cataract surgery outcomes
2. Recognize the importance of preoperative dry eye assessment
3. Explore effective treatment strategies for dry eye management

2

DISCLOSURES

- NONE

3

OCULAR SURFACE DYSFUNCTION

- Spectrum of diseases impairing the ocular surface which leads to a constellation of clinical signs and patient symptoms
- Dry Eye Disease is the most common subtype
- Many others can be present at the same time or masquerade as dry-eye disease.
  - Blepharitis, Epithelial basement dystrophy, Salzmann nodular degeneration, Allergic conjunctivitis, conjunctivochalasis, floppy eyelid syndrome, etc

HASHEMI H, ET AL. PREVAZLENCD OF DRY EY SYNDROME IN AN ADULT POPULATION. CLIN EXP OPHTHALMOL 2014; 42:242-248

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OCULAR SURFACE DYSFUNCTION: WHY SHOULD WE CARE?

- Prevalence
  - Varies in literature between 5-20%[1,2]
  - Reported as high as 35% in some populations[1,2]
  - Prevalence significantly increases with age[3]
- Can impair critical refractive measurements like keratometry values
  - Leading to poor surgical outcomes

1. HASHEMI H, ET AL. PREVALENCE OF DRY EYE SYNDROME IN AN ADULT POPULATION. CLIN EXP OPHTHALMOLOGY 2014; 42:242-248
2. CHIA E-M ET AL. PREVALENCE AND ASSOCIATIONS OF DRY EYE SYNDROME IN AN OLDER POPULATION: THE BLUE MOUNTAIN STUDY. CLIN EXP OPTHALMOL 2003; 31: 229-232
3. THE EPIDEMIOLOGY OF DRY EYE DISEASE: REPORT OF THE EPIDEMIOLOGY SUBCOMMITTEE OF THE INTERNATIONAL DRY EYE WORKSHOP (2007). OCUL SURF 2007;5(93-107
4. HAN KE ET AL. EVALUATION OF DRY EYE AND MEIBOMIAN GLAND DYSFUNCTION AFTER CATARACT SURGERY. AM J OPHTHALMOL 2014. 157:1144-1150.

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OCULAR SURFACE DYSFUNCTION: WHY SHOULD WE CARE?

- Reported to increase after Cataract Surgery[4]
  - Worsening of Corneal fluorescein staining patterns for up to 3 months after cataract surgery[5]
  - TBUT significantly reduced postoperatively compared with pre-surgery baseline for up to 1 month after surgery[6]
  - Femtosecond laser-assisted cataract increases post-surgery dry eye disease vs manual phacoemulsification[6]

Can impair Visual quality and function after cataract surgery, which might affect the patient's perceived surgical outcome[7]

4. HAN KE ET AL. EVALUATION OF DRY EYE AND MEIBOMIAN GLAND DYSFUNCTION AFTER CATARACT SURGERY. AM J OPHTHALMOL 2014. 157:1144-1150
5. CETINKAYA S, ET AL. THE COURSE OF DRY EYE AFTER PHACOEMULSIFICATION SURGERY. BMC OPHTHALMOL 2015; 15:68.
6. YU Y, ET AL. EVALUATION OF DRY EYE AFTER FEMTOSECOND LASER-ASSISTED CATARACT SURGERY. J CATARACT REFRACT SURG 2015; 41:2614-2623.
7. GOTO E. ET AL. IMPAIRED FUNCTIONAL VISUAL ACUITY OF DRY EYE PATIENTS. AM J OPHTHALMOL 2002; 109; 1934-1940.

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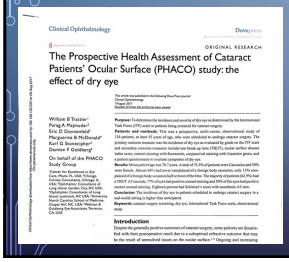
THE PROSPECTIVE HEALTH ASSESSMENT OF CATARACT PATIENTS' OCULAR SURFACE (PHACO) STUDY: THE EFFECT OF DRY EYE


Clinical Ophthalmology

ORIGINAL RESEARCH

The Prospective Health Assessment of Cataract Patients' Ocular Surface (PHACO) study: the effect of dry eye

- 136 patients
  - 55 years or older (mean 70.7 years), 73.5% white, 50% women
- 70% denied stinging or burning
- 60% denied FBS
- 60% denied being affected by any symptoms of dry eye

*Blurred vision more likely than burning/FBS

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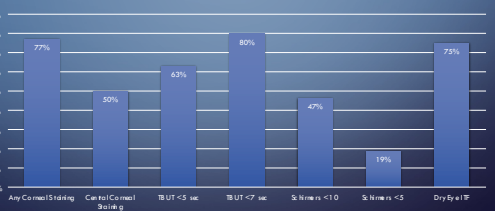
PHACO STUDY: RESULTS



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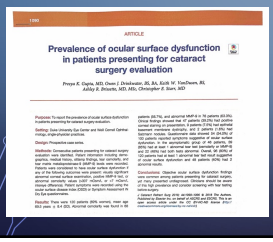
PREVALENCE OF OCULAR SURFACE DYSFUNCTION IN PATIENTS PRESENTING FOR CATARACT SURGERY EVALUATION


ARTICLE

Prevalence of ocular surface dysfunction in patients presenting for cataract surgery evaluation

120 patients

- Mean age 69.5 yo, 69% female
- 86% had at least 1abnormal tear test
- 40% had at least 2 abnormal tear tests
- Asymptomatic group
  - 85% either abnormal TOT or MMP-9
  - 48% had both

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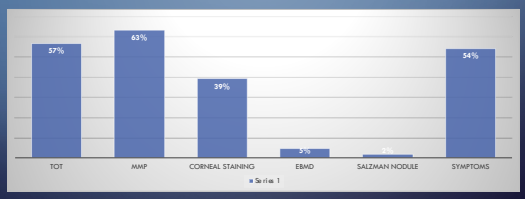
PREVALENCE OF OCULAR SURFACE DYSFUNCTION



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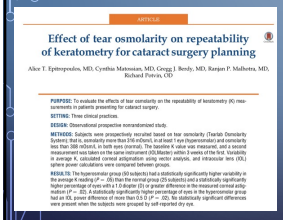
OCULAR SURFACE DYSFUNCTION: WHY SHOULD WE CARE?


ARTICLE

Effect of tear osmolarity on repeatability of keratometry for cataract surgery planning

50 hyperosmolar patients (1 eye >316 mOsm/L in one eye and 25 normal (both eyes <308 mOsm/L)

- Baseline Ks and then measured again within 3 weeks
- Hyperosmolar group (HG) had statistically significant higher variability in average K readings
- HG had statistically significant higher percentage of eyes with a 1.0D or greater difference int the measured corneal astigmatism.
- NO statistically significant significant differences found when subjects were grouped by self-reported dry eye.

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OCULAR SURFACE DYSFUNCTION: WHY SHOULD WE CARE?

- Poor association between signs and symptoms of ocular surface dysfunction[8]
- Traditional tests like TBUT and Schirmer can have low sensitivity and specificity[9]
- Newer diagnostic tests like Tear Osmolarity (TOT) and Matrix metalloprotease-9 (MMP-9) have high sensitivity and specificity[10,11,12]

Critical to Identify and address any tear film and ocular surface abnormalities BEFORE cataract surgery[13]

8. NICHOLS KK ET AL. THE LACK OF ASSOCIATION BETWEEN SIGNS AND SYMPTOMS IN PATIENTS WITH DRY EYE DISEASE. CORNEA 2004;23:762-770
9. LEMP MA, ET AL. TEAR OSMOLARITY IN THE DIAGNOSIS AND MANAGEMENT OF DRY EYE DISEASE
10. SULLIVAN BD ET AL. AN OBJECTIVE APPROACH TO DRY EYE DISEASE SEVERITY. INVEST OPHTHALMOL VIS SCI 2010; 51:6125-6130.
11. SAMBURSKY R., ET AL SENSITIVITY AND SPECIFICITY OF A POINT-OF-CARE MATRIX METALLOPROTEINASE-9 TEST FOR CONFIRMING DRY EYE DISEASE. CORNEA 2014; 33; 812-818.
12. SCHIFFMAN RM ET AL. RELIABILITY AND VALIDITY OF THE OCULAR SURFACE DISEASE INDEX. ARCH OPHTHALMOL 2000; 118:615-621.

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OCULAR SURFACE DYSFUNCTION: HOW TO IDENTIFY IT IN SURGICAL PATIENTS

REVIEW/UPDATE

An algorithm for the preoperative diagnosis and treatment of ocular surface disorders

Christopher E. Starr, MD, Preeya K. Gupta, MD, Marjan Farid, MD, Kenneth A. Beckman, MD, Clara C. Chan, MD, FRCSC, Elizabeth You, MD, José A.P. Gomes, MD, PhD, Brandon D. Ayers, MD, John P. Berdahl, MD, Edward J. Holland, MD, Terry Kim, MD, Francis S. Mah, MD, the ASCRS Cornea Clinical Committee

- Developed by the ASCRS Cornea Clinical Committee
  - Many surgeons were unaware of the current guidelines for OSD
  - Most surgeons were not using modern diagnostic tests and advanced treatments for OSD
- Algorithm to efficiently diagnose and treat visually significant OSD prior to surgical procedures

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REVIEW/UPDATE

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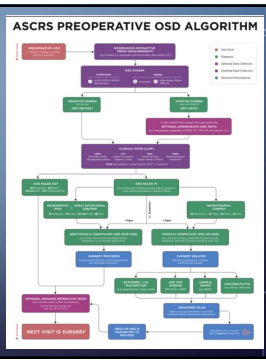
ASCRS PREOPERATIVE OSD ALGORITHM



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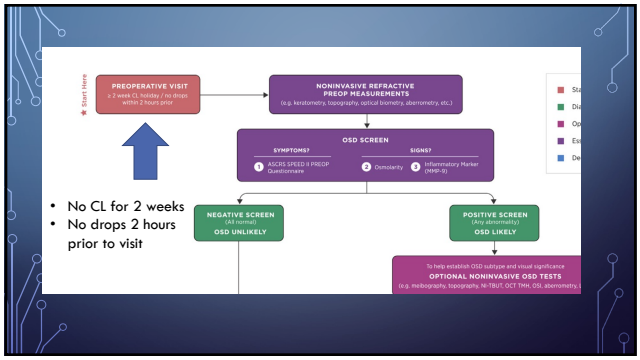

- No CL for 2 weeks
- No drops 2 hours prior to visit

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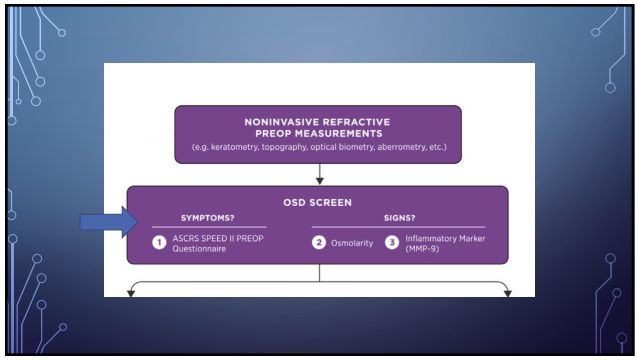

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ASCRS PRE SURGICAL ALGORITHM

- Starts with standardized symptom questionnaire
- None of the published validated DED questionnaires (OSDI, SPEED) were created specifically with the preoperative patient in mind.
- Amended the SPEED questionnaire to include extra questions relevant to identifying OSD (with permission of J&J)
  - Extra questions help to screen for other subtypes of OSD
    - Blepharitis, allergic conjunctivitis, CL-related
  - Extra questions also adapted from Dr. Steven Dell's Cataract and Refractive Lens Exchange Questionnaire
    - Desire for spectacle independence, willingness to pay out-of-pocket fees, self-ascribed personality, etc)

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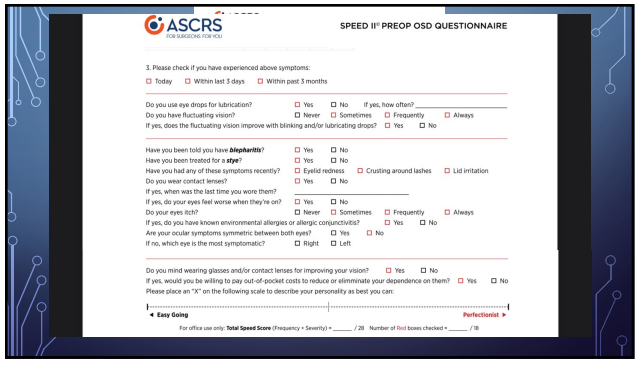

ASCRS FOR SURGEONS FOR YOU

SPEED II© PREOP OSD QUESTIONNAIRE

3. Please check if you have experienced above symptoms:

☐ Today ☐ Within last 3 days ☐ Within past 3 months

Do you use eye drops for lubrication? ☐ Yes ☐ No If yes, how often? _____
Do you have fluctuating vision? ☐ Never ☐ Sometimes ☐ Frequently ☐ Always
If yes, does the fluctuating vision improve with blinking and/or lubricating drops? ☐ Yes ☐ No

Have you been told you have ***blepharitis***? ☐ Yes ☐ No
Have you been treated for a ***stye***? ☐ Yes ☐ No
Have you had any of these symptoms recently? ☐ Eyelid redness ☐ Crusting around lashes ☐ Lid irritation
Do you wear contact lenses? ☐ Yes ☐ No
If yes, when was the last time you wore them? _____
If yes, do your eyes feel worse when they're on? ☐ Yes ☐ No
Do your eyes itch? ☐ Never ☐ Sometimes ☐ Frequently ☐ Always
If yes, do you have known environmental allergies or allergic conjunctivitis? ☐ Yes ☐ No
Are your ocular symptoms symmetric between both eyes? ☐ Yes ☐ No
If no, which eye is the most symptomatic? ☐ Right ☐ Left

Do you mind wearing glasses and/or contact lenses for improving your vision? ☐ Yes ☐ No
If yes, would you be willing to pay out-of-pocket costs to reduce or eliminate your dependence on them? ☐ Yes ☐ No
Please place an "X" on the following scale to describe your personality as best you can:

◄ Easy Going — Perfectionist ►

For office use only: **Total Speed Score** (Frequency + Severity) = _____ / 20 Number of first boxes checked = _____ / 18

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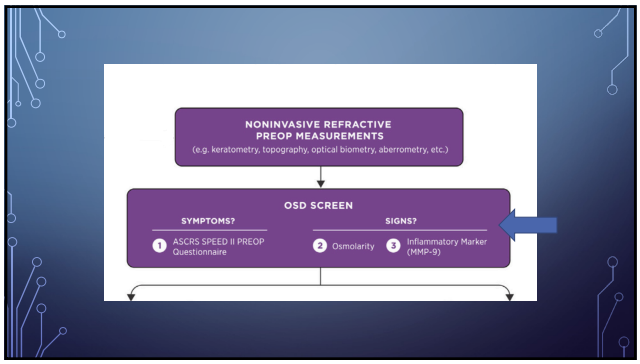

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ASCRS OSD ALGORITHM

- Tear Osmolarity and Tear Inflammation (MMP-9) testing
  - Widely available
  - Relatively inexpensive
  - Rapidly and easily performed by techs
  - High sensitivity and specificity in diagnosis of DED
  - ***Imperative that patients do not apply eye drops within 2 hours before testing either***

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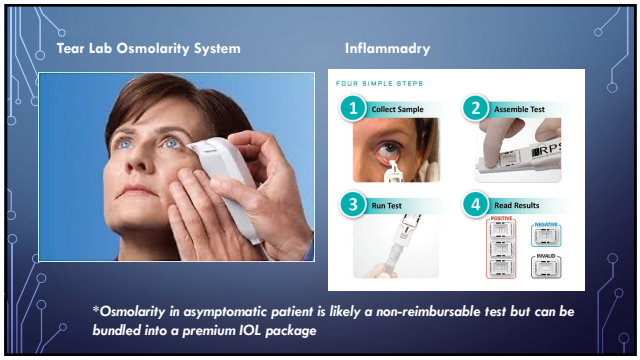

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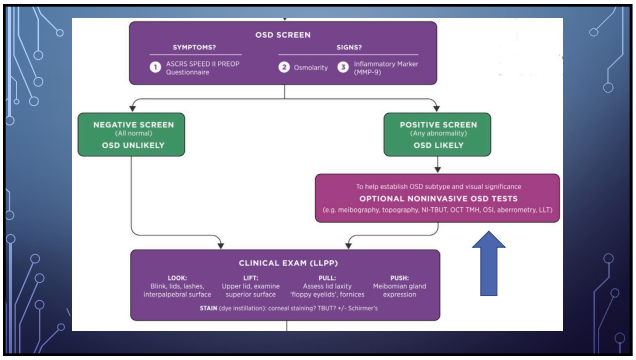

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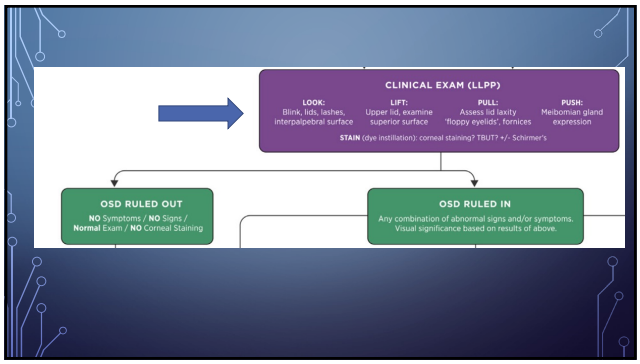

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LOOK

- Blink quality and quantity
- EyeLids for malposition, lagophthalmos, proptosis, exposure, entropion or ectropion, and trichiasis
- Tear Meniscus Height (TMH).
- Signs of anterior and posterior blepharitis
  - Scurf, collarettes, foamy tears, cylindrical dandruff, Demodex mites, bacterial overgrowth, keratinization, telangiectasias, capping, chalazia
- Interpalpebral ocular surface
  - Conjunctival injection, follicles and papillae, discharge and mucus, concretions, conjunctivochalasis, pingueculae, pterygia, conj scarring, sympblepheron
- Interpalpebral corneal surface
  - Loss of clarity, pterygia, subepi scarring, Salzmann nodules, filamnets, dystrophies (EBMD)

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LIFT AND PULL

Lifting up and then pulling out the upper eyelid

- Superior Limbic keratitis and superior corneal scars
- Rule out superior EBMD and identify eyelid laxity/floppy eyelid syndrome
  - Very common
  - Often missed
  - Can be visually significant preop and postop

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PUSH

- Pushing on lower lid margin and expressing meibomian glands
  - Quality, Quantity, and Flow of meibum

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VITAL DYE STAINING

- Fluorescein
  - Assess tear-film stability (TBUT)
    - Less than 10 seconds considered abnormal
  - Stain any epithelial defects
  - Strips apply a more controlled amount of dye for better visualization of corneal surface
  - Moderate to severe staining with minimal symptoms
    - Neurotrophic Keratitis → test corneal sensation

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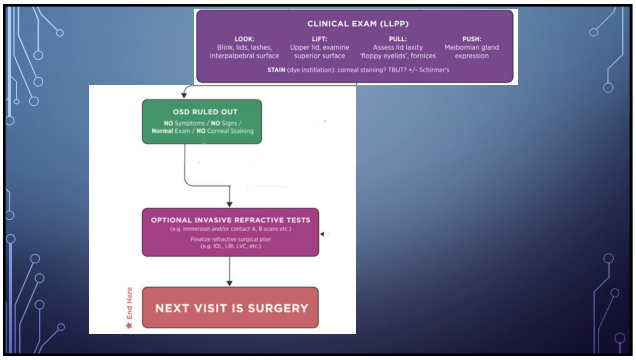

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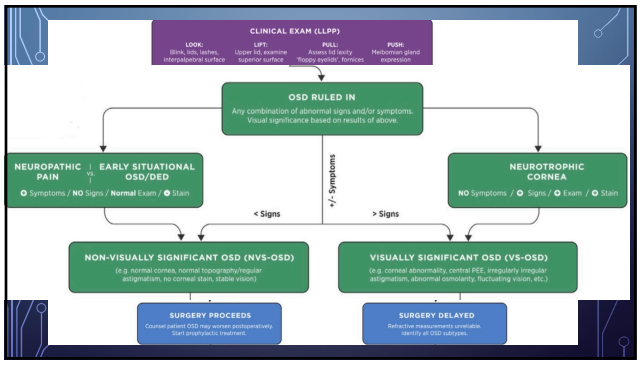

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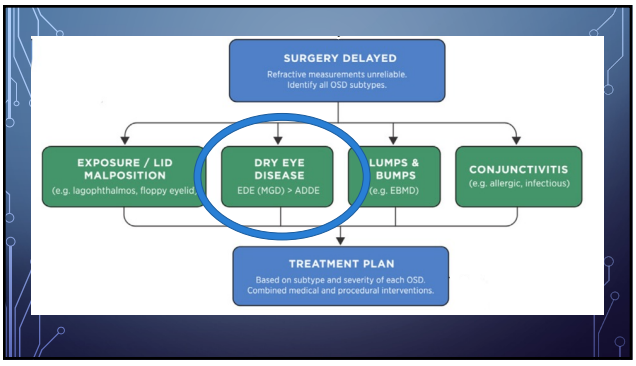

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TREATMENT OF VS-OSD IN SURGICAL PATIENTS

- Goals
  - Minimize surgical delays
  - Maximize preoperative measurement confidence
  - Reduce post-operative complications
- Quick restoration of tear film homeostasis
  - Optimize preop measurements
  - Maximize postop patient satisfaction
- Standard treatment
  - Artificial tears/lubricants, warm compresses, lid hygiene, and nutritional supplements
  - insufficient to rapidly reverse
- Combination of medical and procedural interventions
  - based on disease subtype and severity

Monotherapy approach and waiting period isn't feasible

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TREATMENT OF VS-OSD IN SURGICAL PATIENTS

- Topical Steroids
  - AD-DED and E-DED →loss of tear homeostasis →inflammation
  - Immediately effective
    - Decrease tear-film inflammatory cytokines
  - Loteprednol 0.5% and fluorometholone greatly improve signs and symptoms of DED[15]
    - No significant steroid-related complications over 4 -6 week course
  - Lower threshold for initiation in surgical patients preop

15. PFLUGFELDER SC ET AL. A RANDOMIZED DOUBLE-MASKED, PLACEBO-CONTROLLED, MULTICENTER COMPARISON OF LOTEPREDNOL ETABONATE OPHTHALMIC SUSPENSION 0.5% AND PLACEBO FOR TREATMENT OF KERATOCONJUNCTIVITIS SICCA IN PATIENTS WITH DELAYED TEAR CLEARANCE

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TREATMENT OF VS-OSD IN SURGICAL PATIENTS

- Topical antiinflammatory drugs
  - Cyclosporin A plus topical steroid BID was effective in managing dry eye in the cataract setting[16]
    - Symptomatic and clinical improvement improvement in as little as 2 weeks
  - Lifitegrast
    - Has more rapid onset of action than Cyclosporin A
    - Improvement of symptoms and signs as early as 2 weeks after starting treatment[17]

16. DONNENFELD ED ET AL. STUDY GROUP. LIFITGRAST OPHTHALMIC SOLUTION 5.0% FOR TREATMENT OF DRY EYE DISEASE: RESULTS OF THE OPUS-1 PHASE 3 STUDY. OPHTHALMOLOGY 2014; 121: 475-483.
17. TAUBER J ET AL. OPUS-2 INVESTIGATORS. LIFITEGRAST OPHTHALMIC SOLUTION 5% VS PLACEBO FOR TREATMENT OF DRY EYE DISEASE: RESULTS OF THE RANDOMIZED PHASE III OPUS-2 STUDY. OPHTHALMOLOGY 2015; 122:2423-2431.

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TREATMENT OF VS-OSD IN SURGICAL PATIENTS

- Oral Tetracyclines
  - Ocular rosacea or lid margin inflammation
  - Inhibits tear film cytokines, including MMP-9[18]
  - Decrease bacterial lid flora →decrease in lipolytic enzymes and meibomian lipid breakdown[18]
  - Decrease risk for lid margin/blepharitis-related postop infections and endophthalmitis[19]
  - 1 month course prior to cataract surgery might help reduce inflammation

18. DE PAIVA CS ET ALL. CORTICOSTEROID AND DOXYCYCLINE SUPPRESS MMP-9 AND INFLAMMATORY CYTOKINE EXPRESSION, MAPK ACTIVATION IN THE CORNEAL EPITHELIUM IN EXPERIMENTAL DRY EYE. EXP EYE RES 2006; 83:526-535.
19. SINE WE ET AL. MINOCYCLINE EFFECT ON MEIBOMIAN GLAND LIPIDS IN MEIBOMIANITIS PATIENTS. EXP EYE RES 2003; 76:417-420.

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LID MARGIN DISEASE TREATMENT

- Regular warm compresses and lid hygiene
  - Low compliance
  - Often do not reach adequate temperatures for sustained periods
  - Expression of glands at home is often difficult to perform adequately
- Antibiotic ointment
  - Lid margin bacterial overgrowth
- Hypochlorous acid solutions
  - Significantly decreases biofilm of lid margin
- Tea tree oil scrubs
  - Demodex mites

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LID MARGIN DISEASE TREATMENT

- Mec

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LID

In-offi

- Lipif

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LID MARGIN DISEASE TREATMENT

In-office thermal pulsation treatments

- iLux
  - Handheld device
  - Lightbased heat and compression under direct visualization by the physician via magnifying lens

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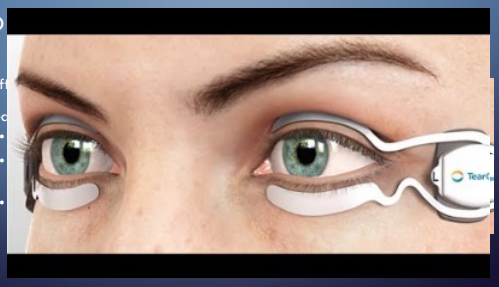

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TREATMENT OF VS-OSD IN SURGICAL PATIENTS: ASCRS CORNEA CLINICAL COMMITTEE RECOMMENDATIONS

- Treat OSD to maximize accuracy of preop measurements and to reduce postop complications
- Corneal staining is the single most critical sign of OSD that should be normalized before surgery
- Aggressively Treat with
  - PFAT, topical steroids, xiidra/restasis
  - In-office treatment including blephex and lipiflow

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OCULAR SURFACE DISEASE IN SURGICAL PATIENTS

In Conclusion

- Incidence of DED and OSD in cataract surgery candidates, especially those who are asymptomatic, is much higher than previously thought
- Impact of DED and OSD on topography, biometry, keratometry, and higher-order aberrations is one of the major causes of disappointing postop outcomes
- Diagnosing and treating DED and OSD prior to surgery is imperative to improve visual outcomes and patient satisfaction postoperatively.

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