REFRACTIVE SURGERY:

It's Not Just LASIK Anymore

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Eye Care of Delaware
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So you think LASIK is always the best option for refractive surgery?

What Are The Options?

- Corneal Refractive Surgery
  - LASIK
  - CustomVue LASIK
  - PRK
  - CustomVue PRK
  - Epi-LASIK
  - LASEK
  - Astigmatic Keratectomy (AK)
  - Limbal Relaxing Incisions (LRI)
  - Radial Keratotomy (RK)
  - Small-Incision Lenticule Extraction (SMILE)
- Refractive Lens Exchange (RLE)
  - Monofocal IOL
  - Toric IOL
  - Femtosecond Laser
  - Extended Range IOL
- Phakic IOL
  - ICL
  - Verisyse
- KAMRA
- Intacs
- Conductive Keratoplasty (CK)

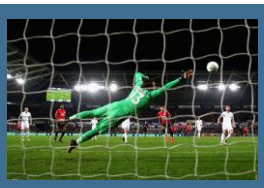
What Dictates Which Procedure ?

Their Refractive Error

- Myopia
  - Low
  - Medium
  - High
- Hyperopia
  - Low
  - Medium
  - High
- Astigmatism

Patient's Goals

- Good Distance Vision
- Good Near Vision
- Both Distance and Near Vision

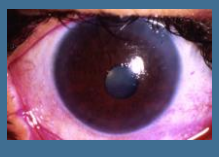


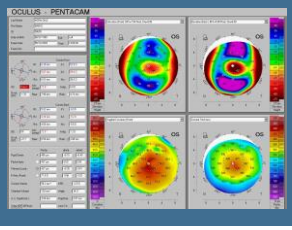
Age

- Pre-Presbyopic
- Presbyopic
- Beginning Cataract ?

Corneal Findings

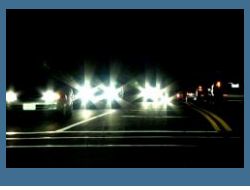
- Cornea Too Thin For LASIK
- Irregular Corneal Topography
- Dry Eye Syndrome





Pupil Size

- Large Pupils / glare



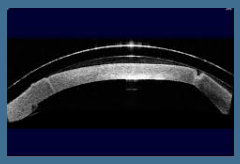
Corneal Refractive Surgery

Radial Keratectomy (RK)

- Developed in 1974, by Svyatoslav Fyodorov MD
- Radial corneal incisions in spoke like pattern
- Diamond knife
- Incisions deep (90%)
- Corrects myopia and astigmatism

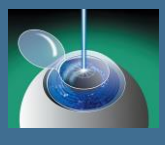
RK

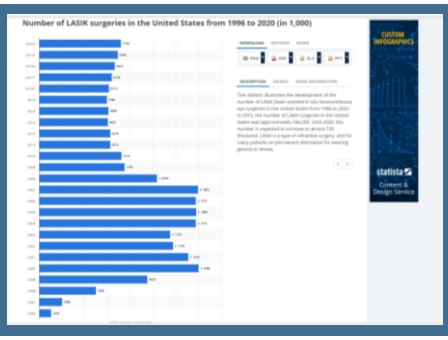
- Complications
  - Corneal perforation
  - Irregular astigmatism
  - Late wound opening and infection
  - Late hyperopic shift
  - Hyperopic shift in high altitude
    - Dr Beck Weathers – Mt Everest 1996



LASIK
(Laser Assisted in situ Keratomileusis)

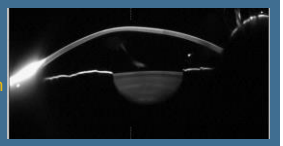
- Wide range of treatable refractive errors
  - Myopia – up to -14D sphere / 5D astigmatism (18yrs or older)
  - Hyperopia – up to +5D sphere / 3D astigmatism (21yrs or older)
  - Mixed Astigmatism – up to 6D (21yrs or older)

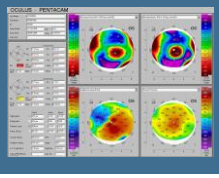




LASIK

- Cornea needs to be thick enough
- Caution with irregular corneas
- Aberrations with higher powers
- Higher regression with hyperopia
- Dryness issues
- Glare around lights at night





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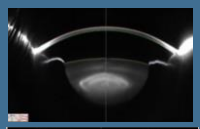

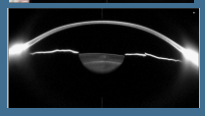

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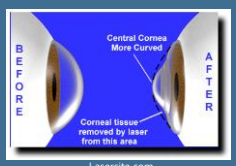

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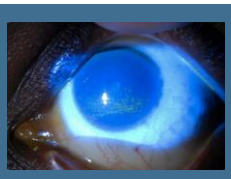
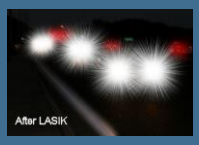
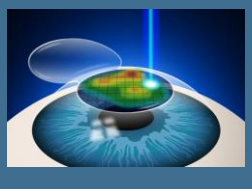




LASIK Procedure

- Topical anesthesia
- Keratome or Femto laser to create flap
- Excimer laser to reshape cornea
- Reposition flap on surface



LASIK Post Op

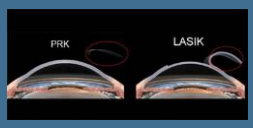
- Quick recovery
- Antibiotic and steroid drops x 1 week
- Artificial tears x 1 – 2 months

PRK (PhotoRefractive Keratectomy)

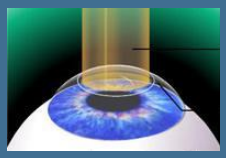
- Myopia - up to -6D sphere / 1D astigmatism (18yrs or older)
  up to -12D / 4D astigmatism (21yrs or older)
- Hyperopia – between +1D to +6 D / 1D astigmatism (21yrs or older)

PRK

- Better option than LASIK when:
  - Thin corneas
  - Irregular corneas
  - Dry Eye Syndrome
  - Sports or work trauma possible



PRK



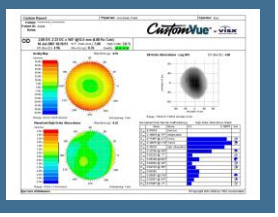
- Topical anesthesia
- No flap
- Alcohol well to remove epithelium
- Laser reshapes cornea on surface
- Central corneal scratch at end of procedure
- Bandage CL

PRK

- BCL x 3 – 4 days
- Pain pills x 2 – 3 days
- Remove BCL
- Slow visual recovery
- Topical antibiotic x 5 days
- Topical steroids x 3 months

CustomVue / Wavefront Technology

- Wavefront instrument
  - Refractive error
  - Higher order aberrations
- Personalized treatment
- More precise
- Reduces higher order aberrations
- Reduces night glare



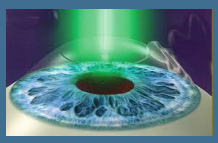
Epi - LASIK

- Topical anesthesia
- Epi-keratome used to remove epithelium with it's BM in a hinged sheet
- Epithelium flapped back
- Excimer laser performed
- Epithelium repositioned
- BSCL placed over eye

- Replace epithelium vs Remove epithelium

LASEK (Laser Assisted Epithelial Keratomileusis)

- Topical anesthesia
- Alcohol well to loosen epithelium
- Epithelial sheet detached and flapped back
- Excimer laser ablation performed
- Epithelium slide back in place
- BSCL placed on eye



Astigmatic Keratectomy (AK)

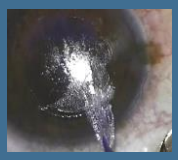
- Paired transverse corneal incisions on steepest meridian
- Flattens corneal in steeper meridian to reduce astigmatism
- Performed with blade

Limbal Relaxing Incisions (LRI)

- Femtosecond Laser incisions
- Periphery of cornea
- Flattens steepest meridian
- Corrects astigmatism

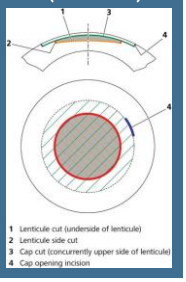
Small Incision Lenticule Extraction (SMILE)

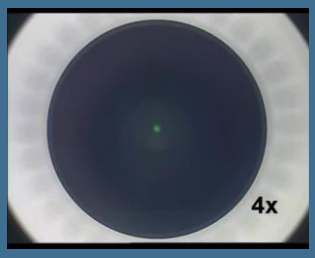
- Developed in 2011
- Corrects :
  - Myopia (-0.50D – -10.00D)
  - Hyperopia
  - Astigmatism (0 – 5.00D)



Small Incision Lenticule Extraction (SMILE)

- Femtosecond laser to create corneal lenticule
- Laser to create 2-4mm tunnel to corneal surface
- Lenticule extracted thru small incision with forceps





SMILE Advantages

Faster recovery of post op Dry Eye
Faster reinnervation of corneal nerves
No flap needed
Outer corneal layers intact – biomechanical stability

SMILE Disadvantages

- Moe difficult to identify low power lenticules to remove
- Enhancements – PRK vs thin flap LASIK - not repeat SMILE
- No hyperopia in US - regression

SMILE

- 85 % of all patients with a preoperative best-corrected visual acuity of 20/20 or higher achieved uncorrected visual acuity of 20/20 or higher after surgery.

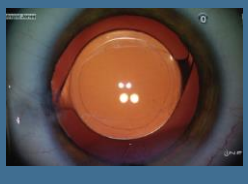
Lens Implant Procedures

Refractive Lens Exchange (RLE)

Cataract Surgery

RLE

- Off label
- Presbyopic patients
  - Hyperopia
  - Myopia

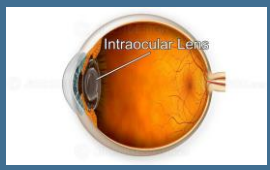


RLE Advantages

- Corrects hyperopia better than any other procedure
- Better option with high refractive powers
- Better option with thin or irregular corneas
- Corrects high amounts of astigmatism
- Stable long term refractive outcome
- Quick visual recovery

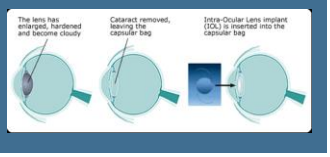
RLE Disadvantages

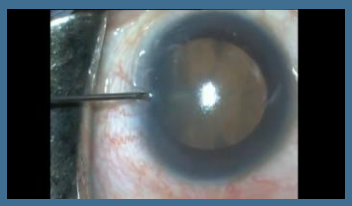
- Eliminates any accommodation
- Higher risk of RD than other prcedures
- Secondary membrane



RLE

- Removal of natural lens with intraocular lens implant (IOL)
- Same procedure as cataract surgery
  - Topical anesthesia
  - Small incision <3mm
  - Capsulorhexis
  - Phacoemuslification
  - IOL insertion





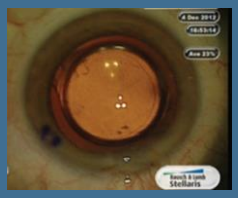
RLE

- Monofocal IOL
- Toric IOL
- Expanded range / Multifocal IOL

- Femtosecond Laser

RLE – Monofocal IOL

- Corrects pre-existing hyperopia & myopia
- Distance Vision IOL
- Does not correct astigmatism
- Will need reading glasses

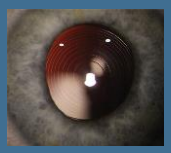


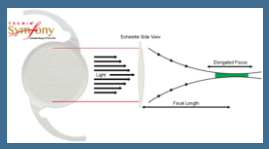
RLE – Toric IOL

- Corrects astigmatism
- Corrects pre-existing hyperopia & myopia
- Monofocal & Extended Range/Multifocal options

RLE – Extended Range / Multifocal IOL

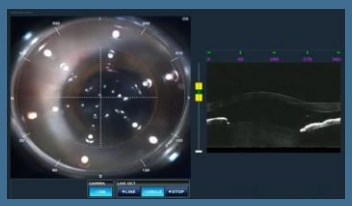
- Corrects pre-existing myopia & hyperopia
- Toric options for astigmatism correction
- Corrects Distance Vision & Functional Near Vision





Femtosecond Laser

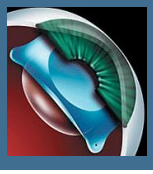
- Used in conjunction with cataract surgery or RLE
  - Monofocal IOL
  - Toric IOL
  - Expanded range IOL
- Laser incisions
- Laser capsulorhexis
- Laser lens fragmentation
- Laser relaxing incisions for astigmatism



Implantable Collamer Lens (ICL)

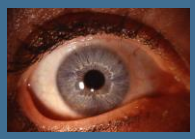
Implantable Collamer Lens (ICL)

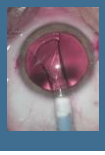
- Corrects high myopia: -3.00 to -20.00
- Does NOT correct astigmatism
- Collagen/silicone implant



ICL

- Laser iridodomy 1 week prior to ICL
- Topical anesthesia
- < 3mm incision
- ICL placed in sulcus





ICL Advantages

- Better visual quality than LASIK in high myopia
- Does not reduce accommodation
- Alternative to LASIK when thin or distorted cornea
- Potentially reversible

ICL Disadvantages

- Does not correct astigmatism
- Does not correct hyperopia
- Increased risk of RD & cataract when compared to LASIK

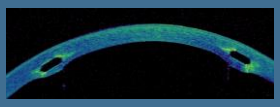
Intacs

Intacs

- Flattens full thickness of central cornea
- Myopia
  - -0.50D to -3.00D
  - No astigmatism correction
- Keratoconus
  - Fully or partially correct myopia & astigmatism
- Post LASIK ectasia

Intacs

- Topical anesthesia
- Create circular intrastromal tunnel (manual or laser)
- Insert plastic ring in tunnel



Intacs Advantages

- One of few treatments for keratoconus
- Intacs along with CXL offers best treatment to stop keratoconus progression
- Flattens cornea without removing tissue
- Potentially reversible

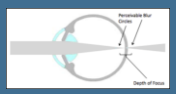
Intacs Disadvantages

- Does not correct astigmatism
- Cornea needs to be 450 μ at tunnel
- Limited prescription range for myopia

KAMRA

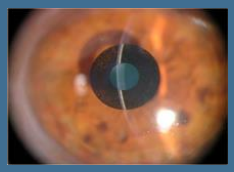
KAMRA

- Correction of presbyopia
- Indications:
  - Age 45 – 60 yrs
  - Refraction: +0.50D to -0.75D
- 3.8mm black disc / 1.6mm central aperture
- Increases depth of focus
- Pinhole effect



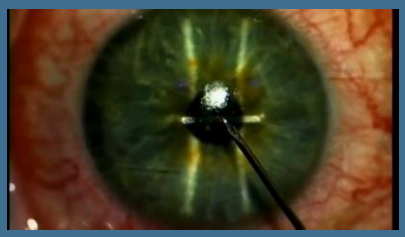
KAMRA

- Implanted in non-dominant eye
- Unlike monovision, still allows good distance vision



KAMRA

- Femtosecond laser to create corneal pocket
- KAMRA inlay slipped into pocket and centered



KAMRA Advantages

- Increases range of vision
- Maintains good distance vision
- Reversible

KAMRA Disadvantages

- Limited to emmetropic patients
- Only 1 eye for near
- May require months for neuro adaption

Radio Frequency Procedures

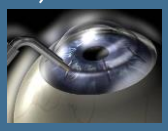
Conductive Keratoplasty (CK)

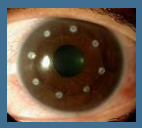
Conductive Keratoplasty (CK)

- FDA approval 2004
- Age 40 and older
- Radiofrequency energy to cornea
- Stromal temperature increases to 150°
- Corrects:
  - Low Hyperopia
  - Presbyopia

Conductive Keratoplasty (CK)

- Topical anesthesia
- Hand held probe
- Spots placed at 6, 7, or 8 mm diameter circle
- 8, 16, 24, 32 spots
- Radiofrequency energy causes localized temperature increase
- Controlled shrinkage of cornea collagen
- Central curvature steepening





CK Advantages

- No tissue removal or thinning
- Less costly
- Can be used in thin corneas, previous LASIK, keratoconus

CK Disadvantages

- Regression
- Results may last only a few months
- Limited hyperopic range +1.50D or less
- Monovision for hyperopia

THANK YOU