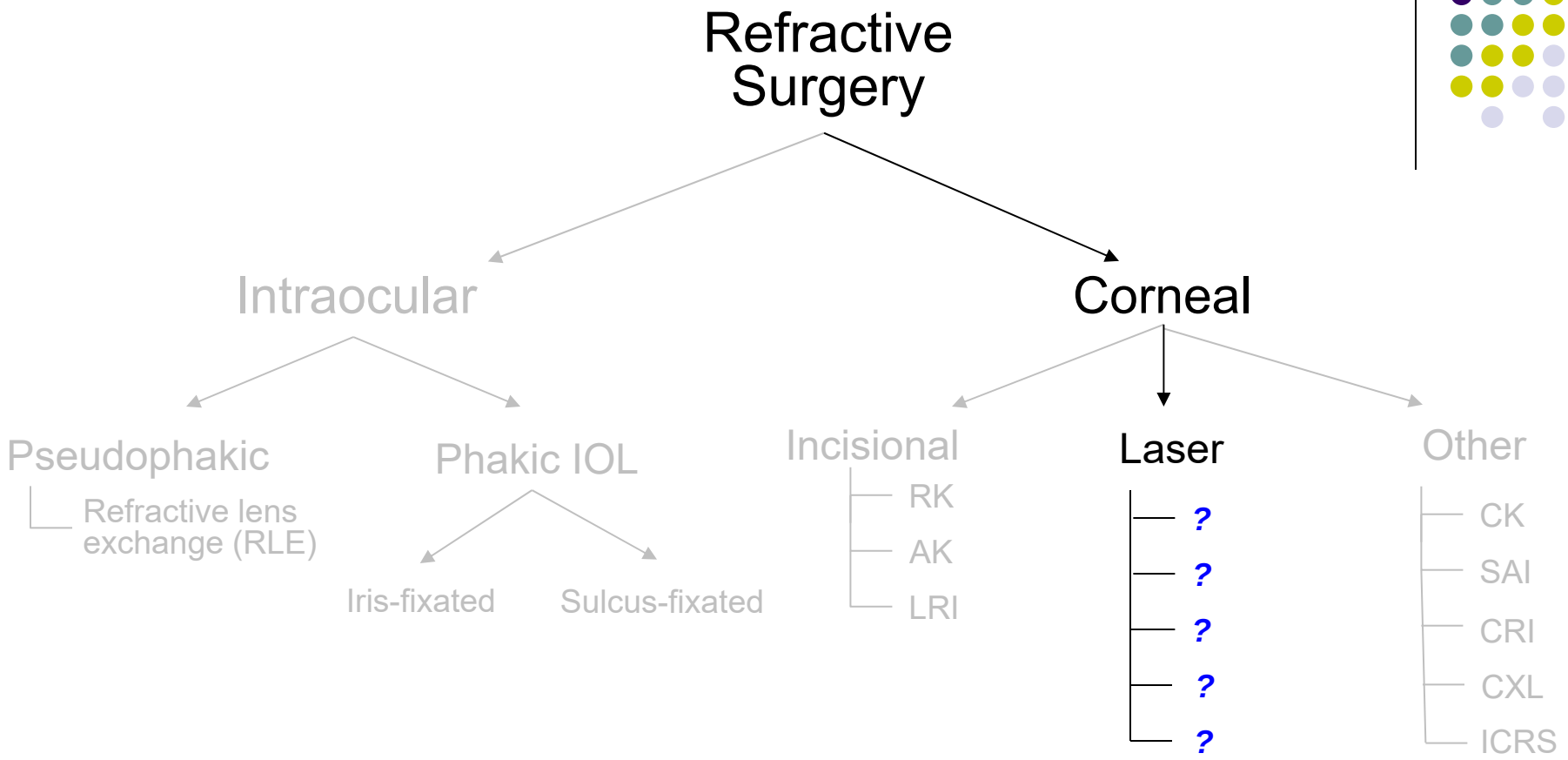
# Photoablative Refractive Surgery



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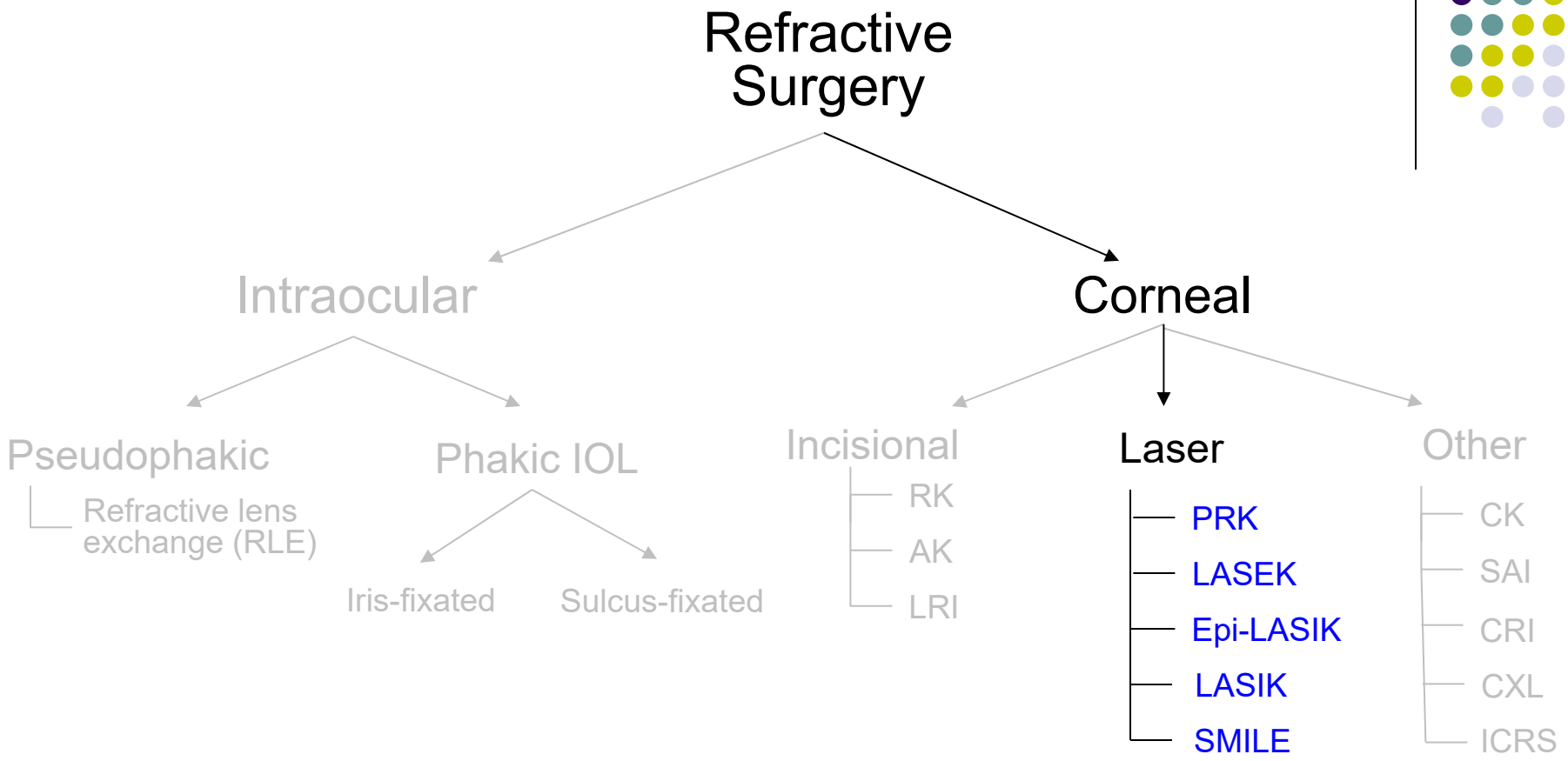

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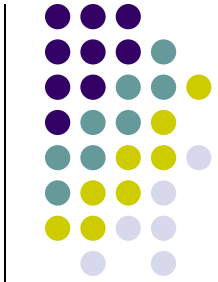
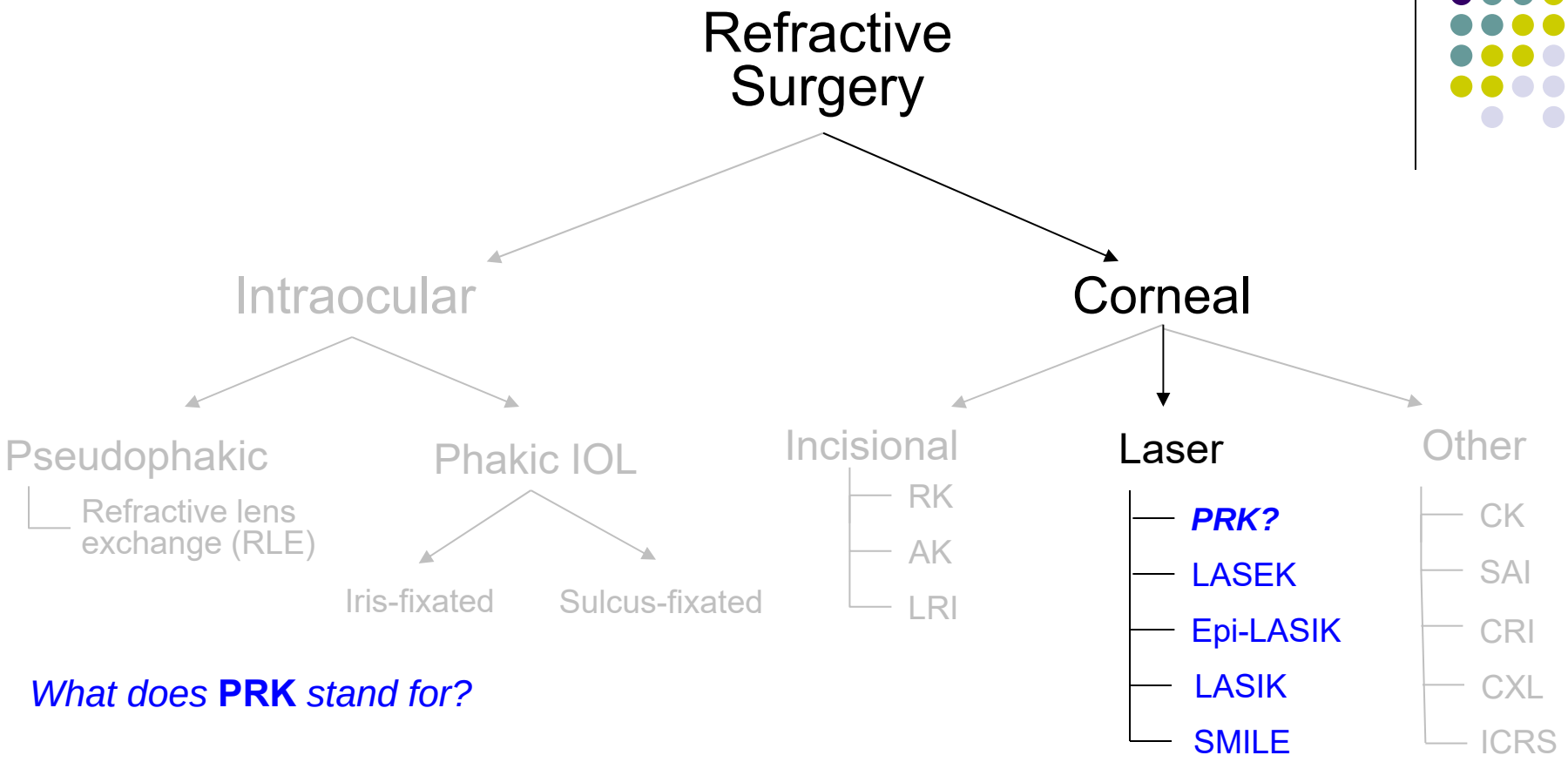
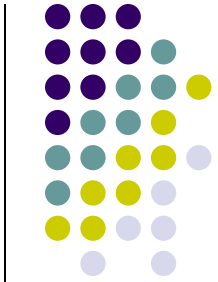
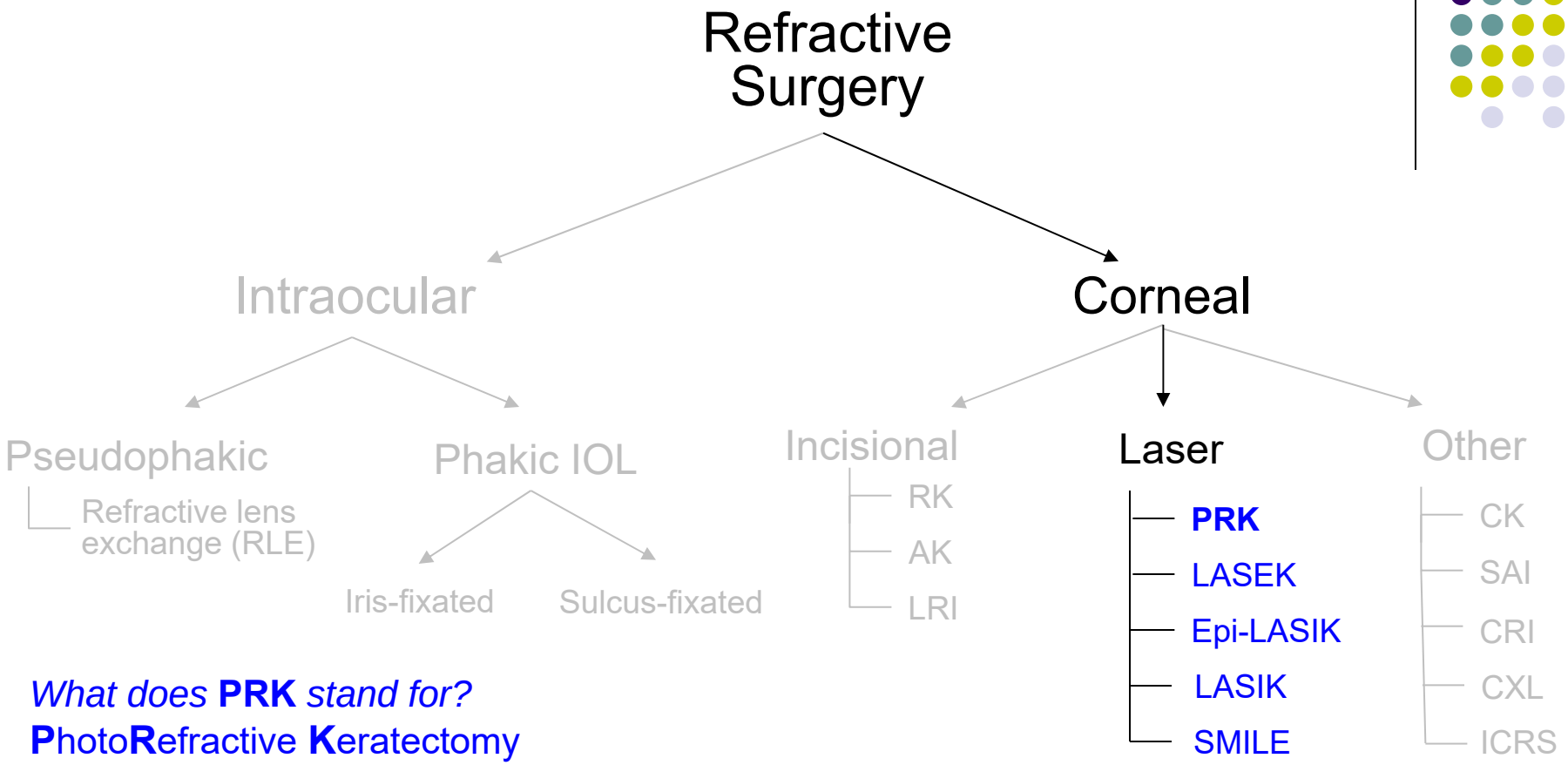





*What does **PRK** stand for?*

# Photoablative Refractive Surgery



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**P**hoto**R**efractive **K**eratectomy

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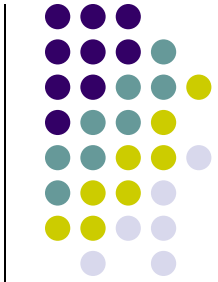

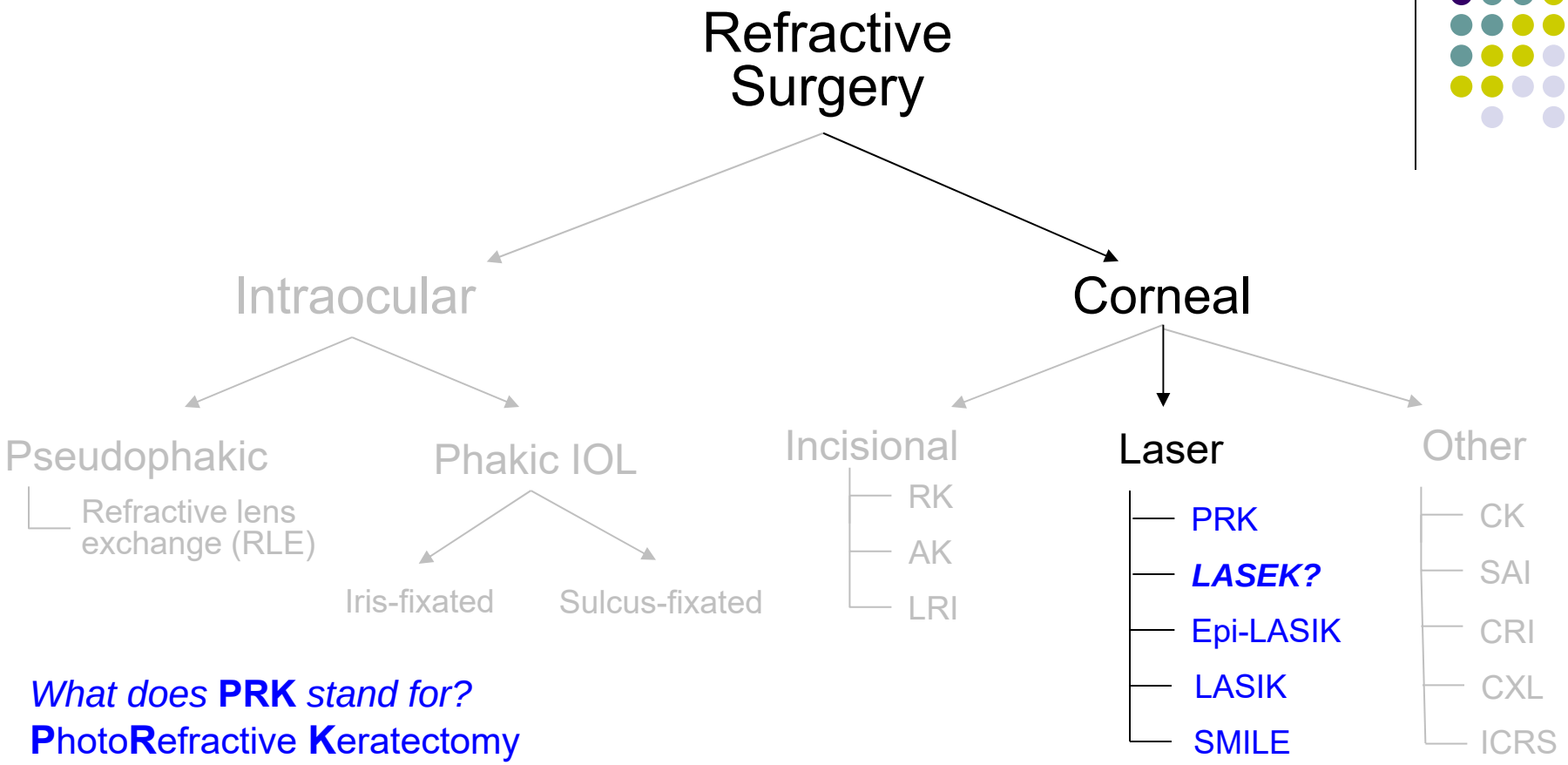


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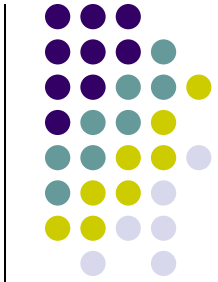

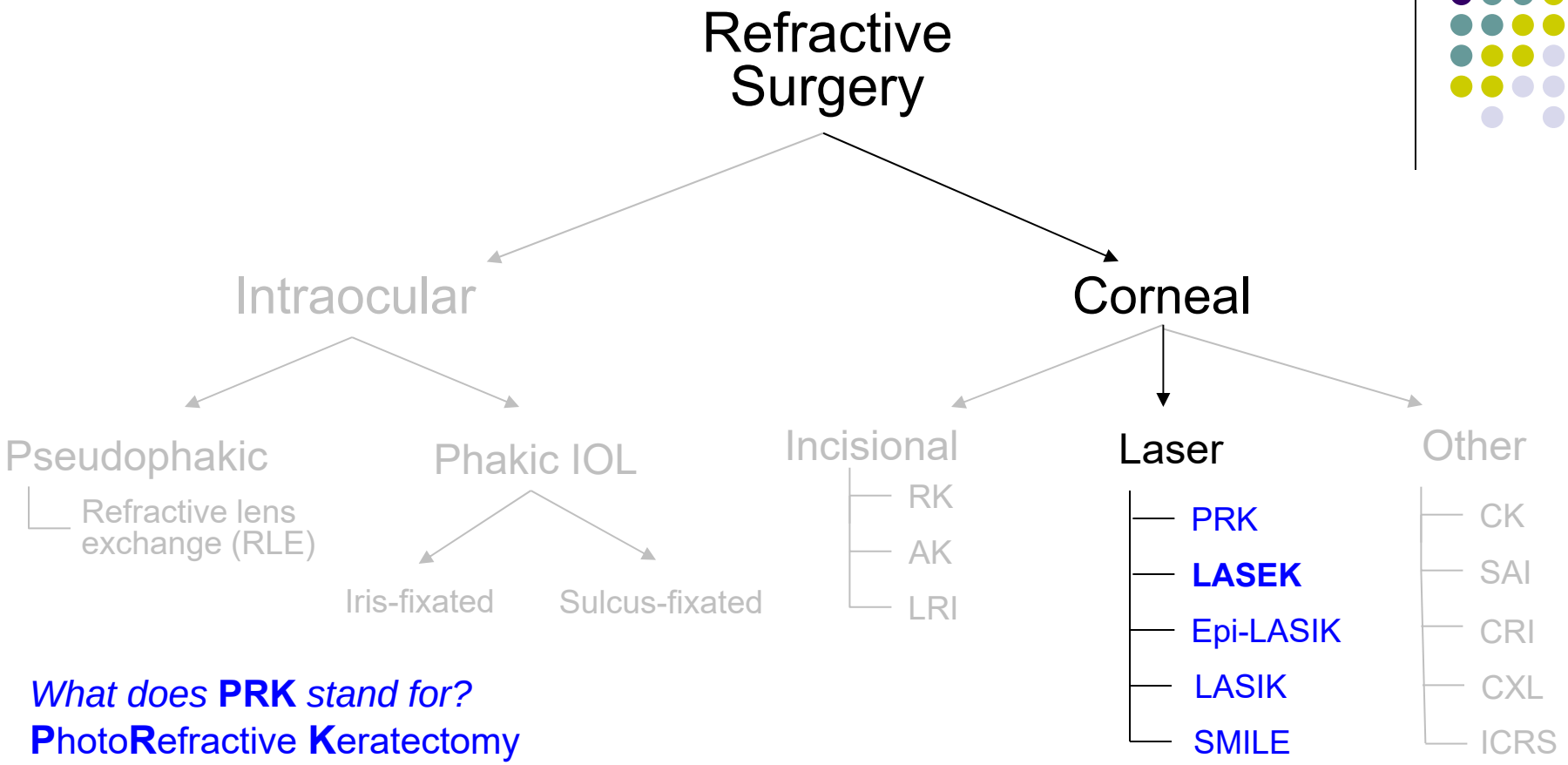


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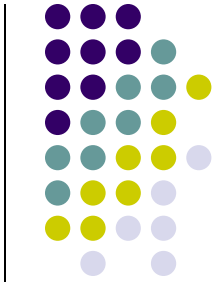

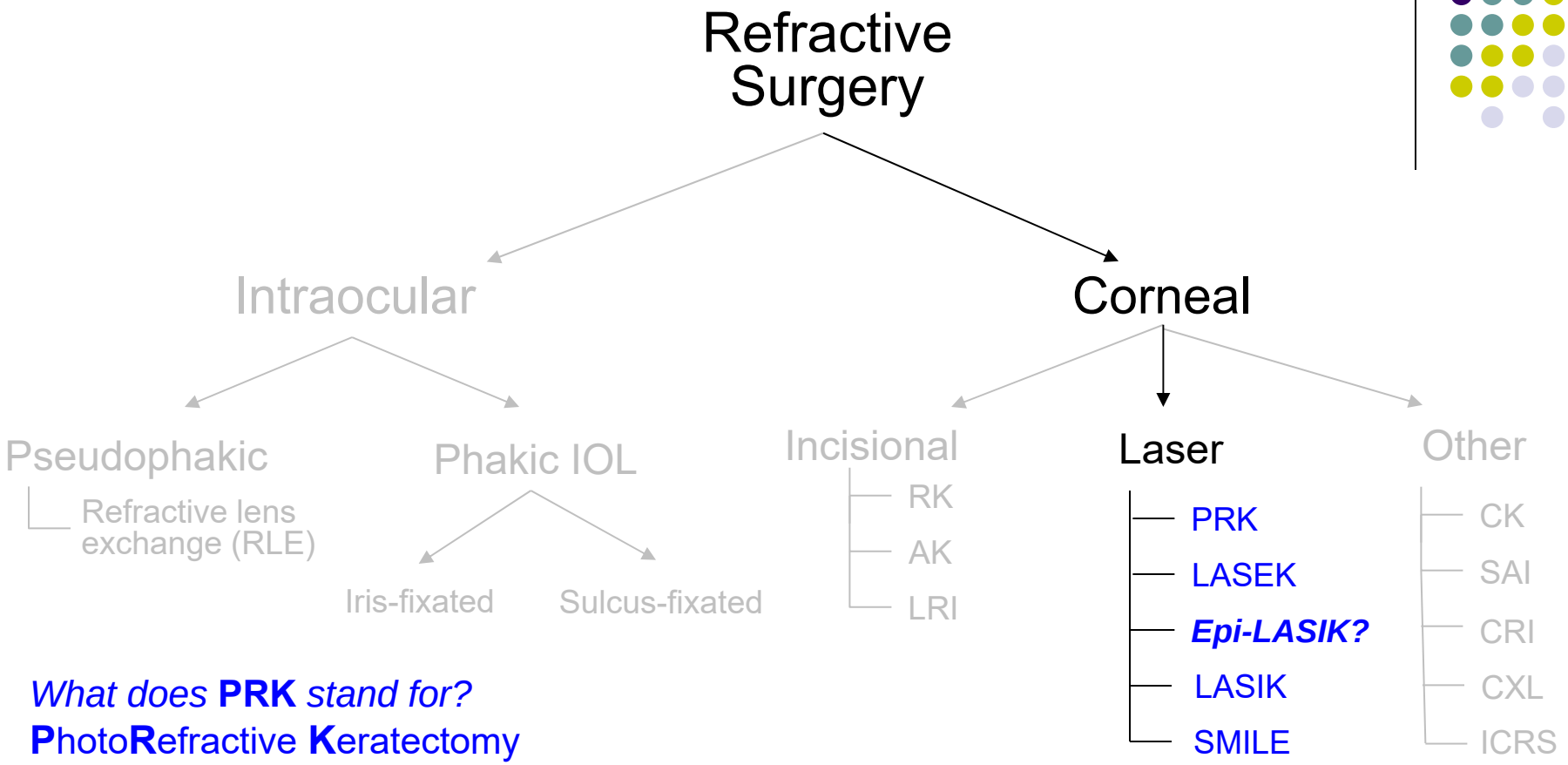


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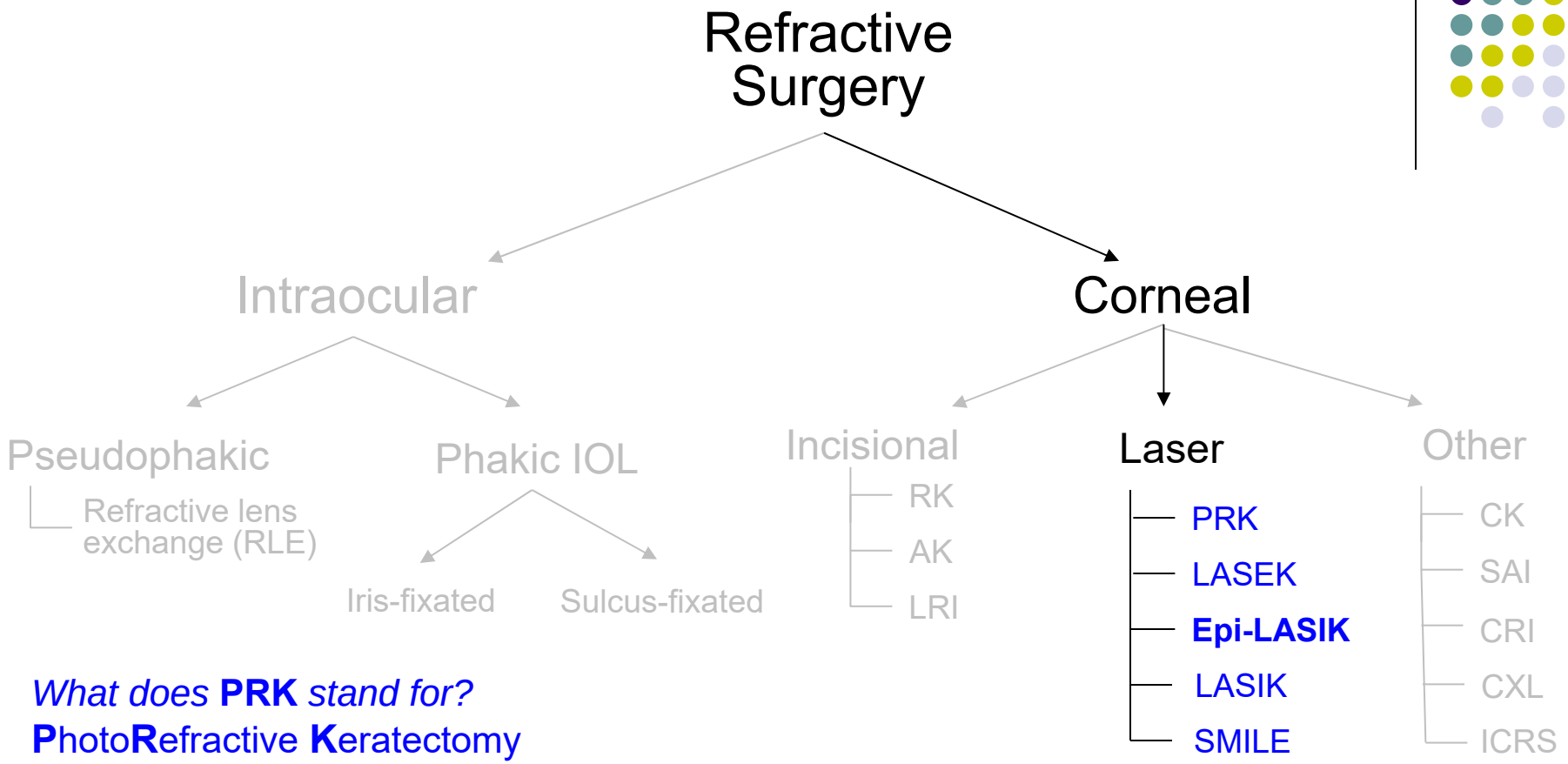


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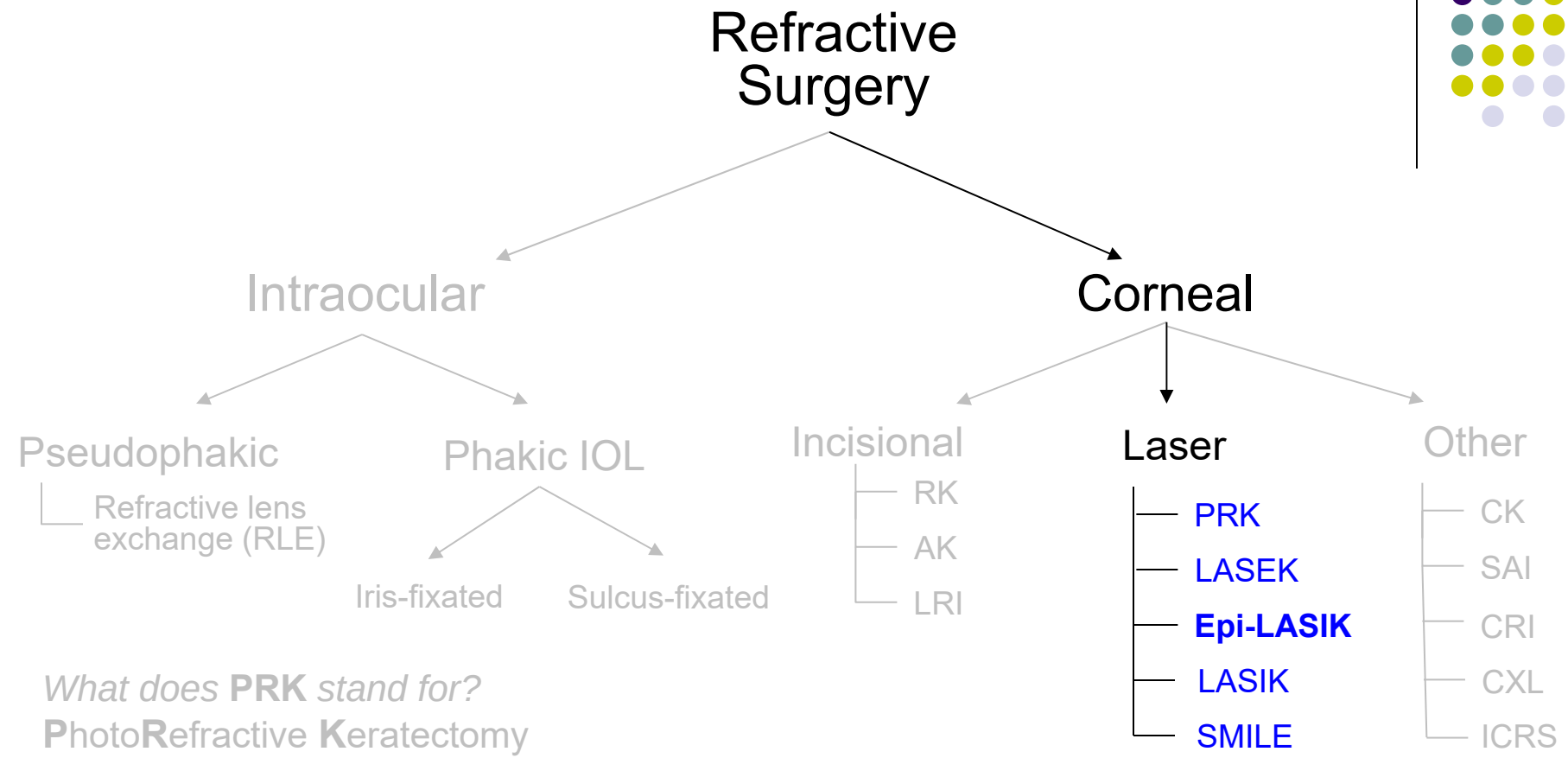


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*What does* **Epipolis** *mean?*

**Epi**polis **LA**

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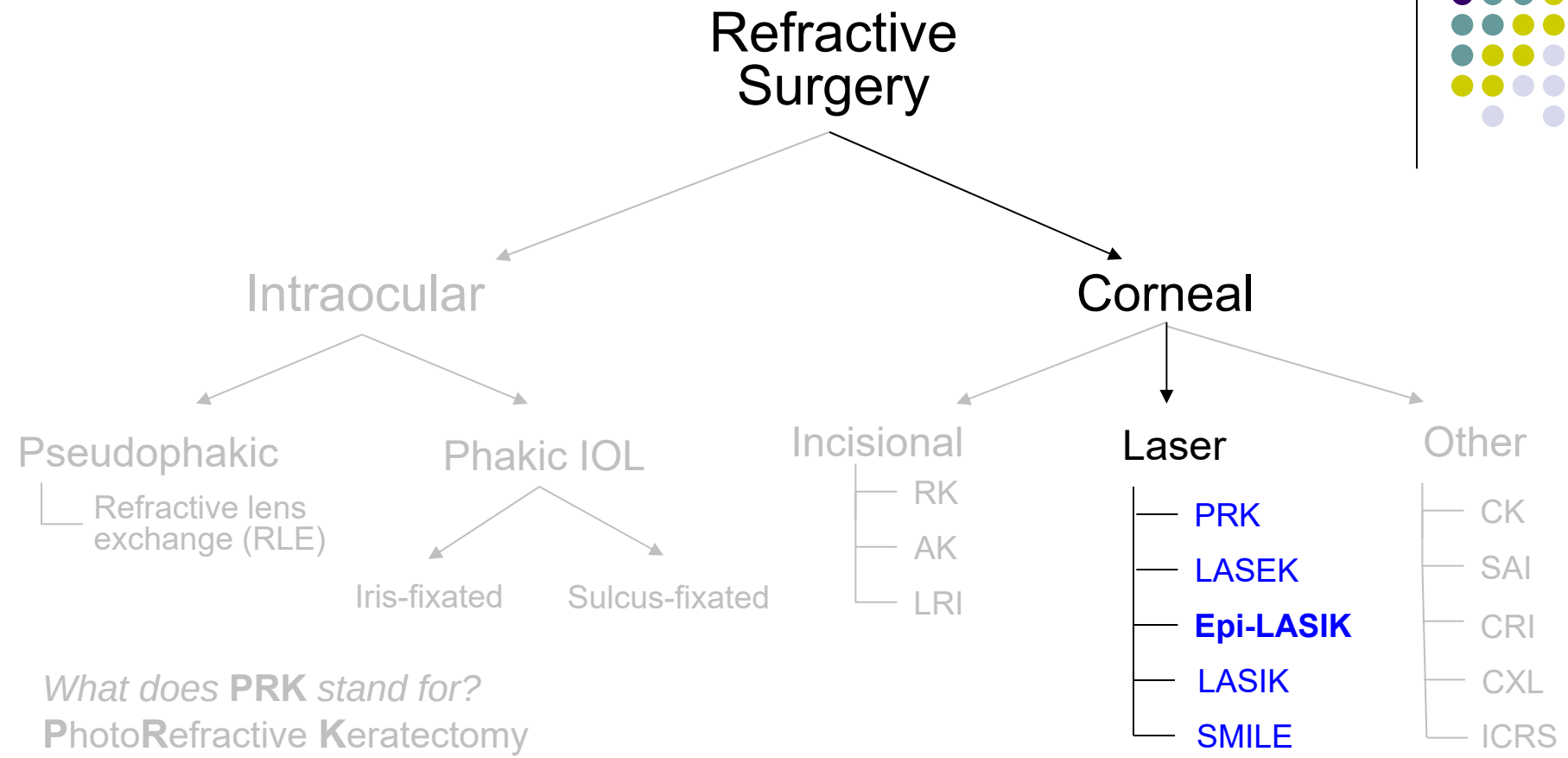


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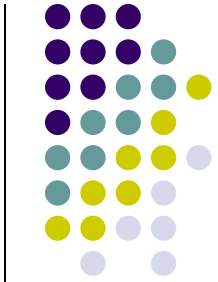
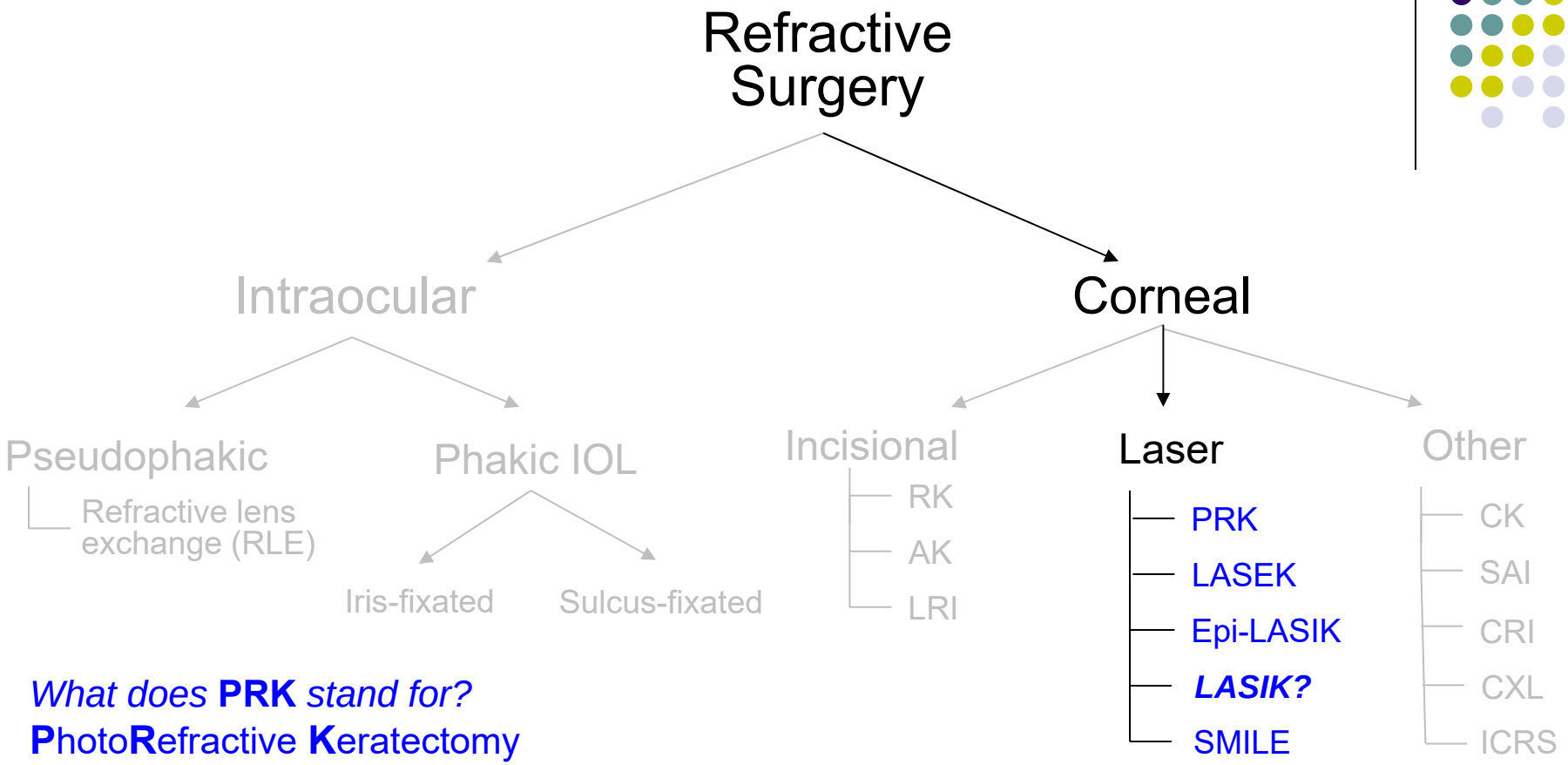
*What does* **Epipolis** *mean?*
It is a Greek word meaning 'superficial'

**Epi**polis

# Photoablative Refractive Surgery



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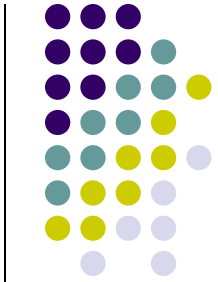

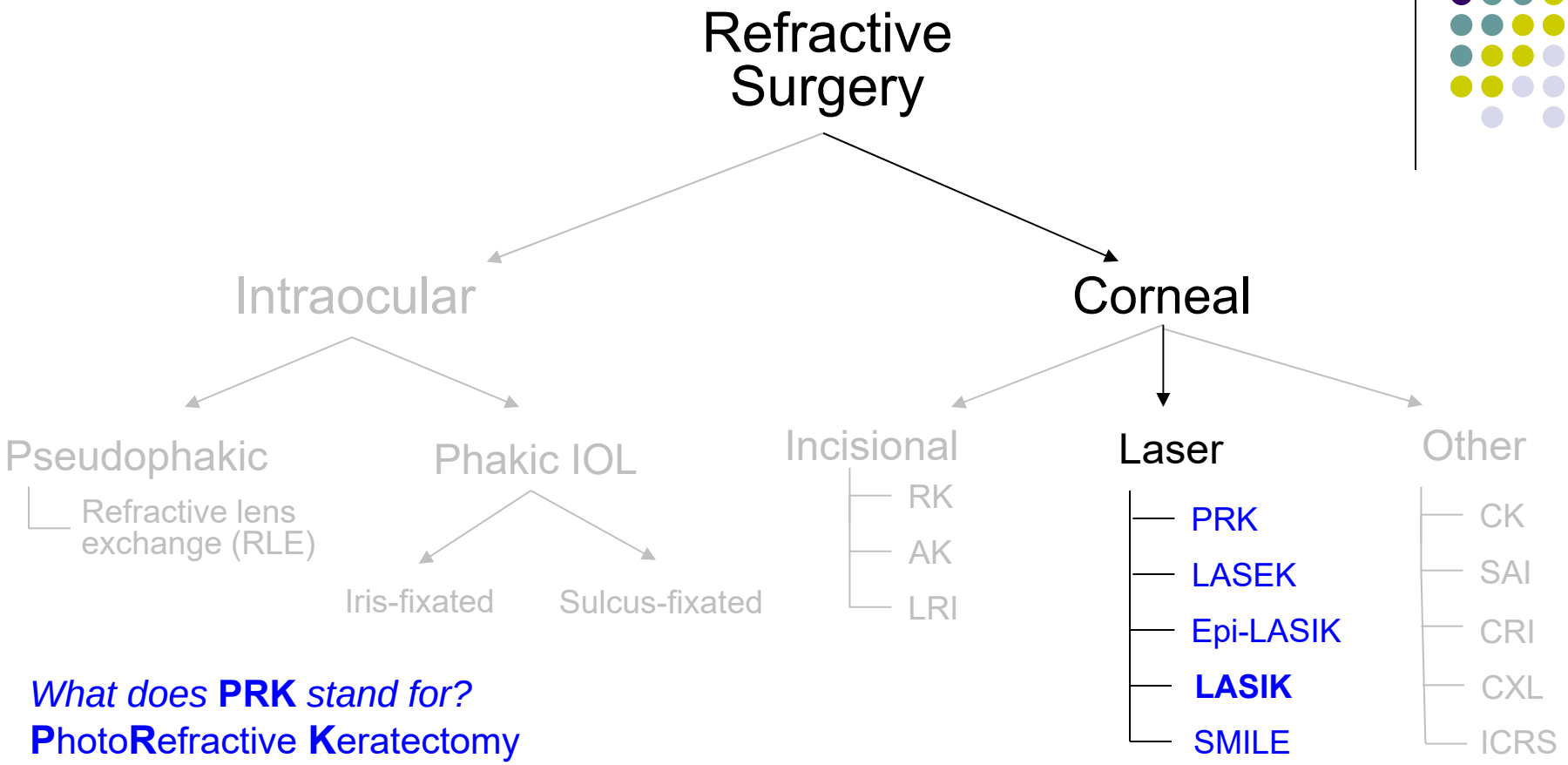


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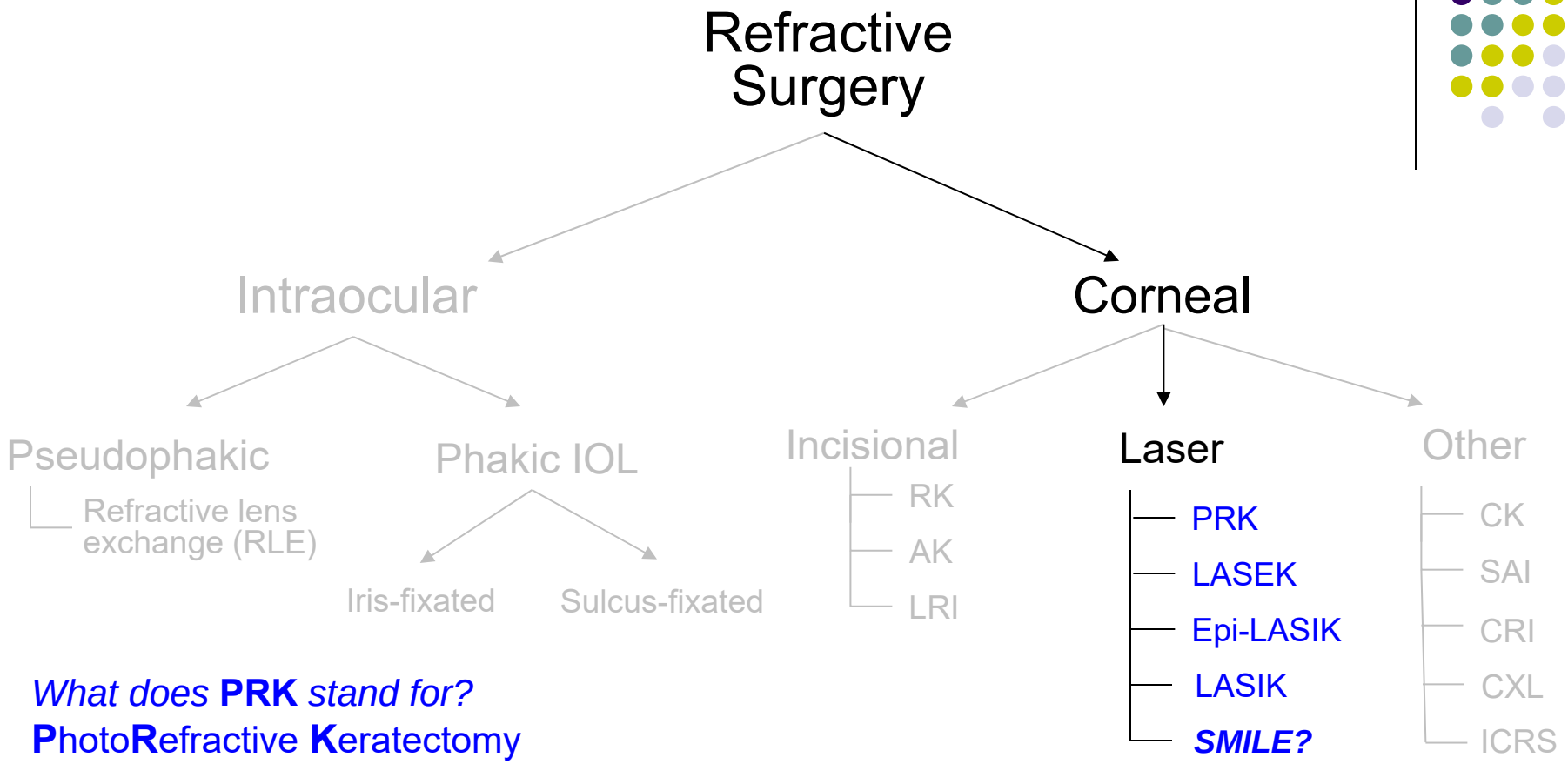


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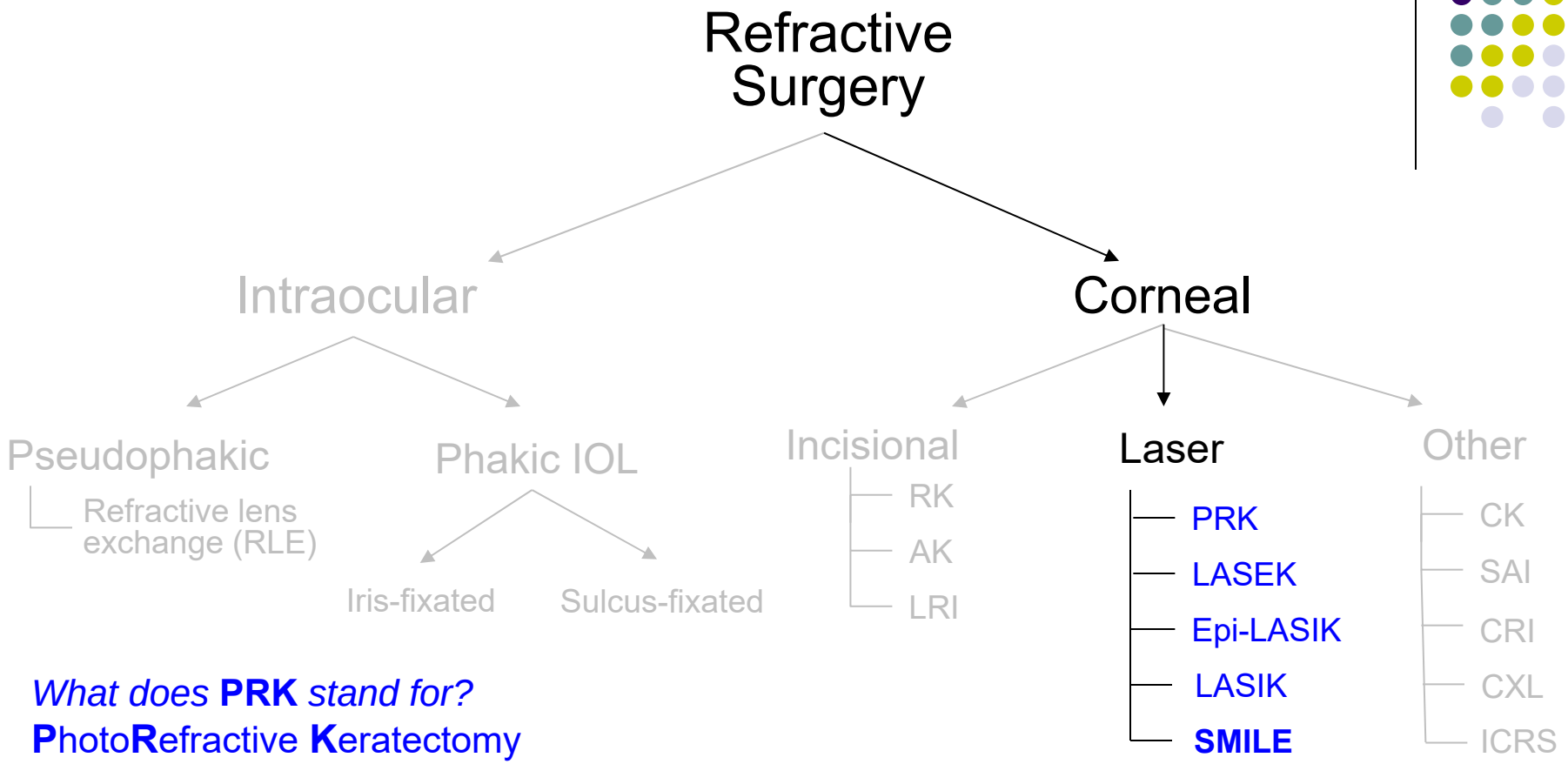


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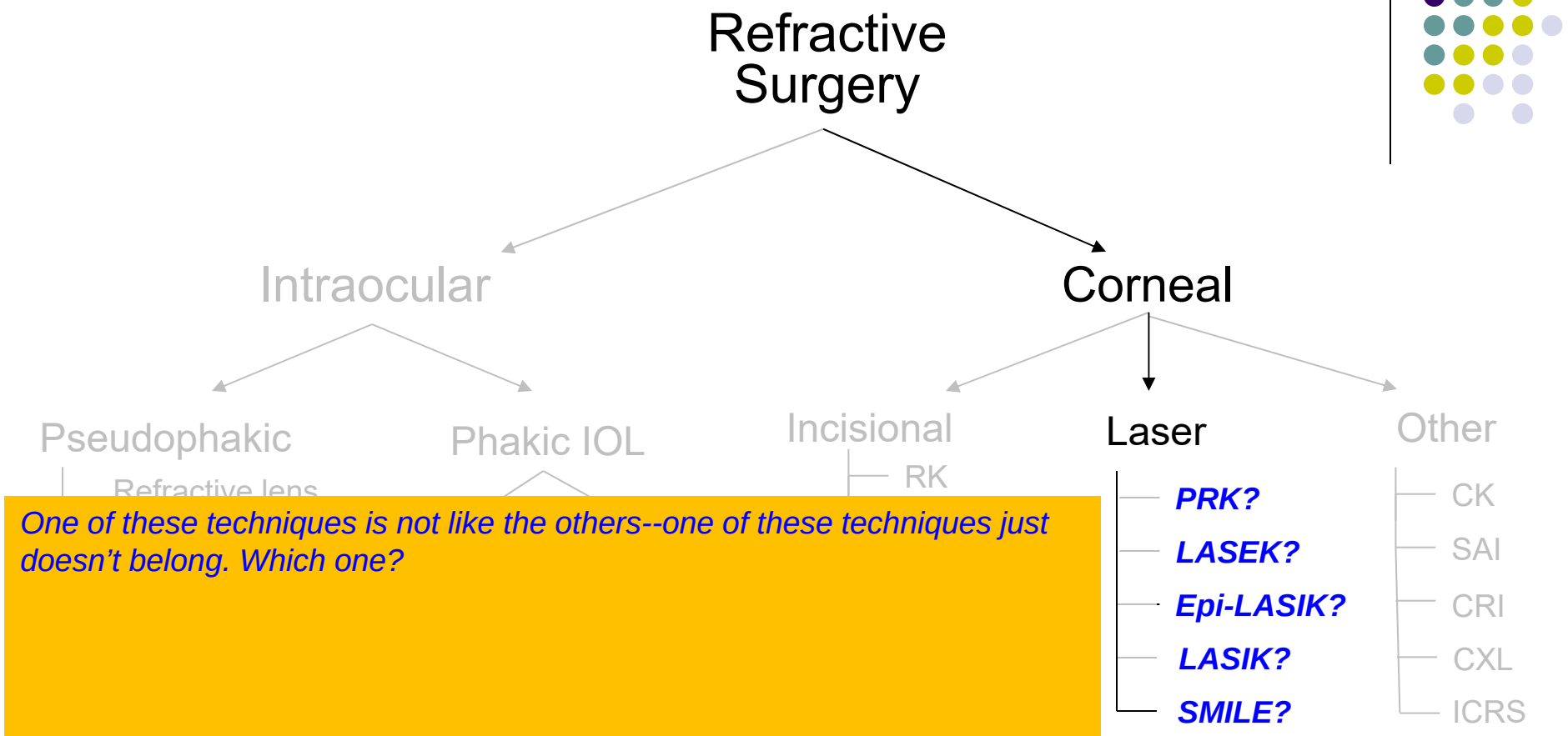
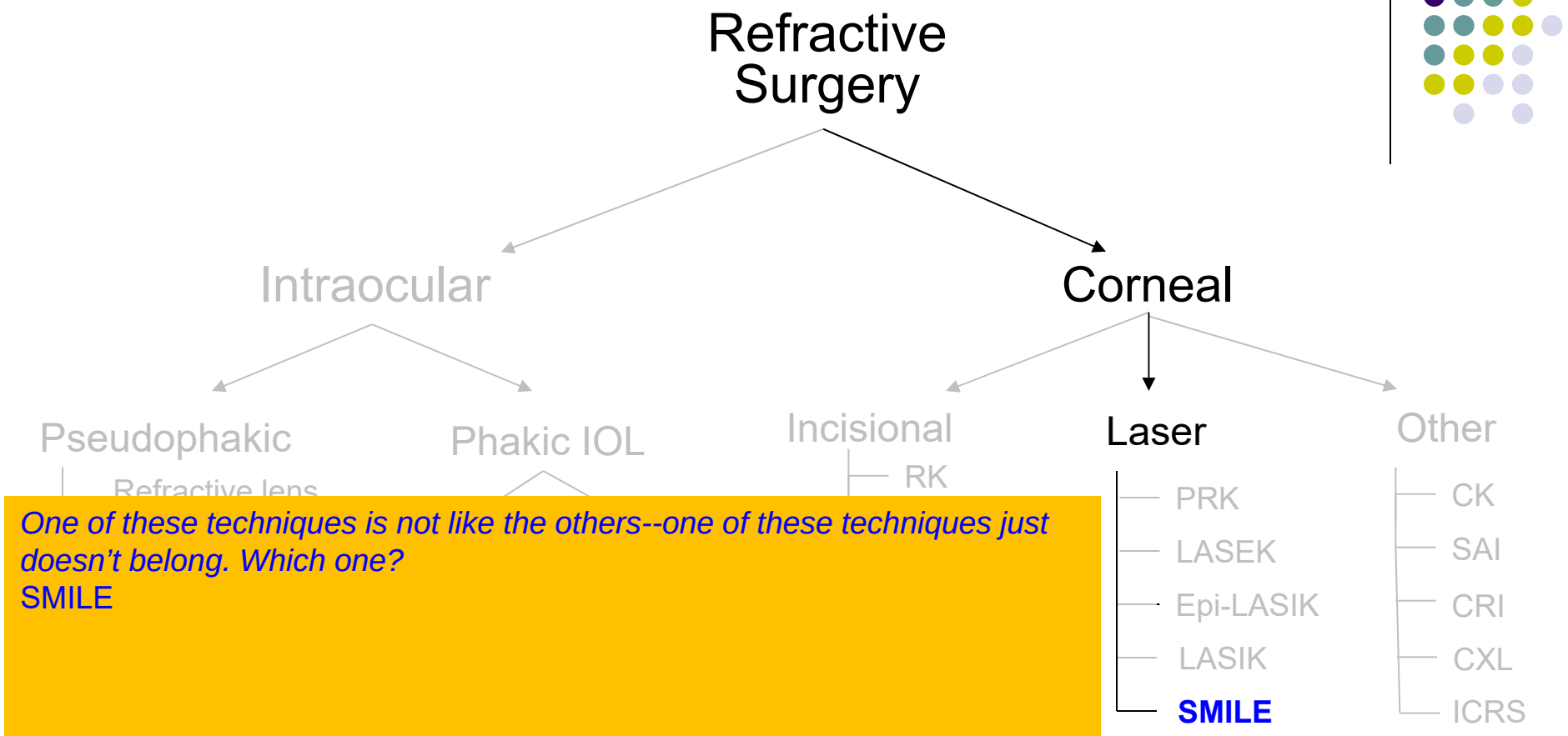
# Photoablative Refractive Surgery




*One of these techniques is not like the others--one of these techniques just doesn't belong. Which one?*

# Photoablative Refractive Surgery

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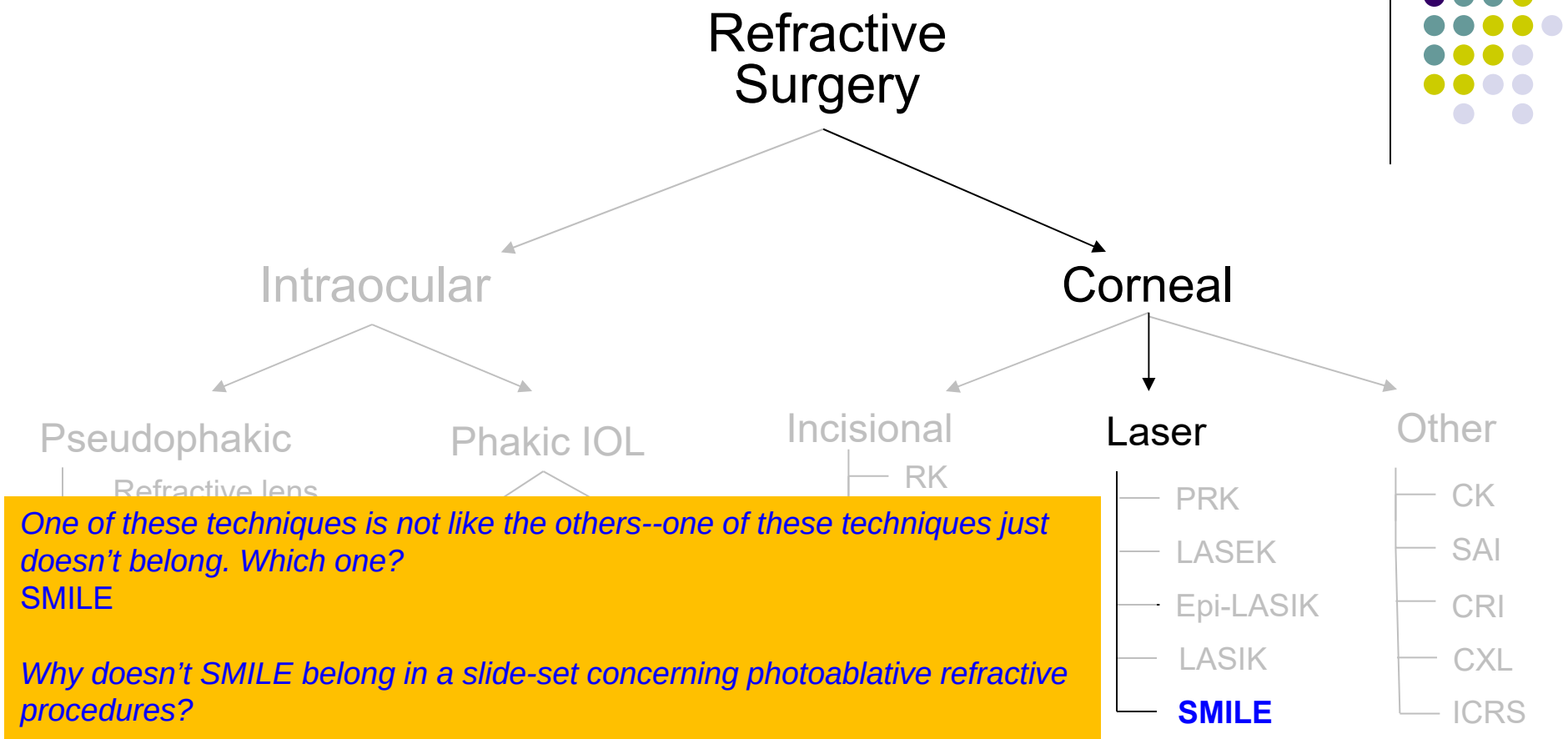
# Photoablative Refractive Surgery

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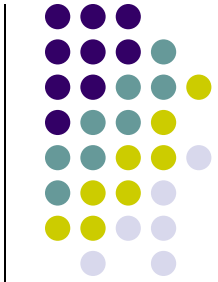
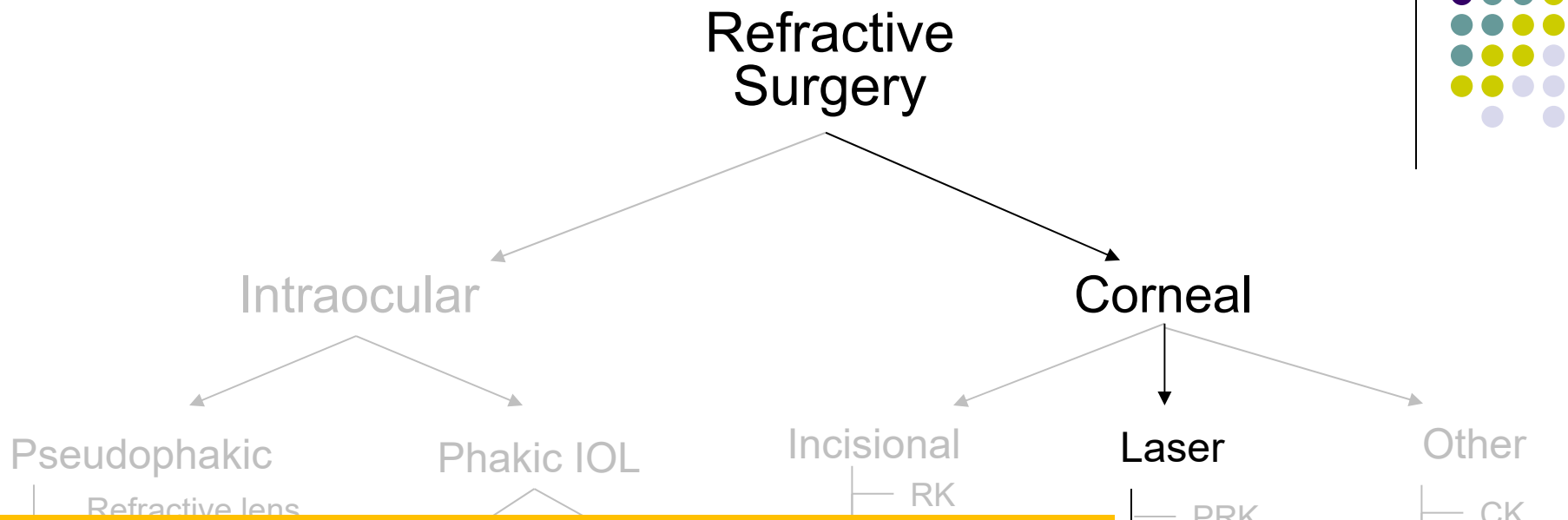
*Why doesn't SMILE belong in a slide-set concerning photoablative refractive procedures?*

# Photoablative Refractive Surgery



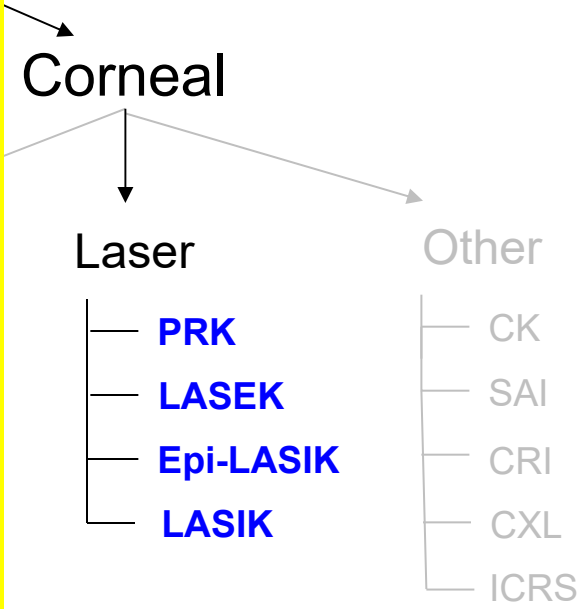



*One of these techniques is not like the others--one of these techniques just doesn't belong. Which one?*
SMILE

*Why doesn't SMILE belong in a slide-set concerning photoablative refractive procedures?*
Photoablative procedures use laser energy to ablate (destroy) corneal tissue, whereas SMILE uses a laser to carve and isolate an intrastromal block (called a *lenticule*) of tissue, which is then removed en bloc. In other words, while SMILE results in a loss of corneal tissue, that tissue is **not** ablated.
(More on SMILE later in the slide-set.)

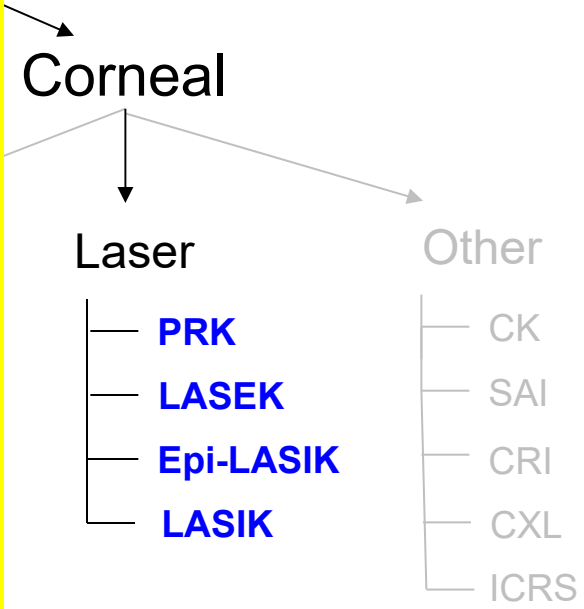
# Photoablative Refractive Surgery

*What sort of laser is used to ablate the corneal tissue?*



# Photoablative Refractive Surgery

*What sort of laser is used to ablate the corneal tissue?*
An **excimer** laser



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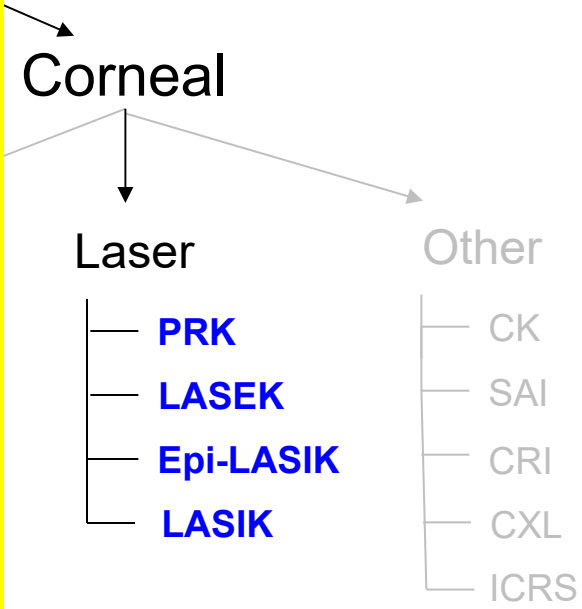
*What is the origin of the word* excimer*?*



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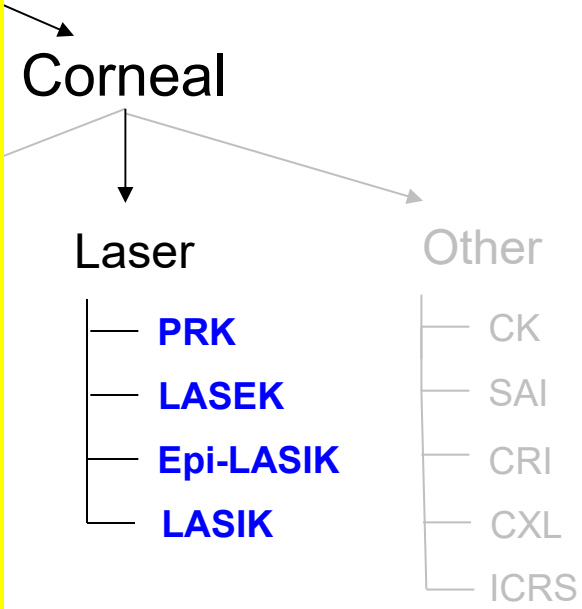

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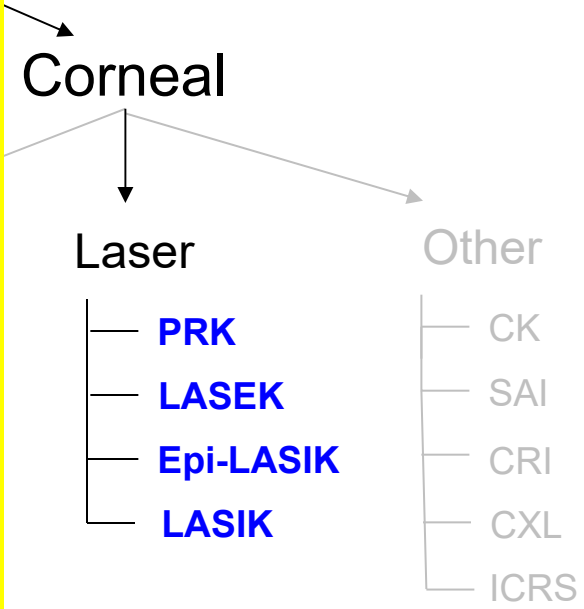

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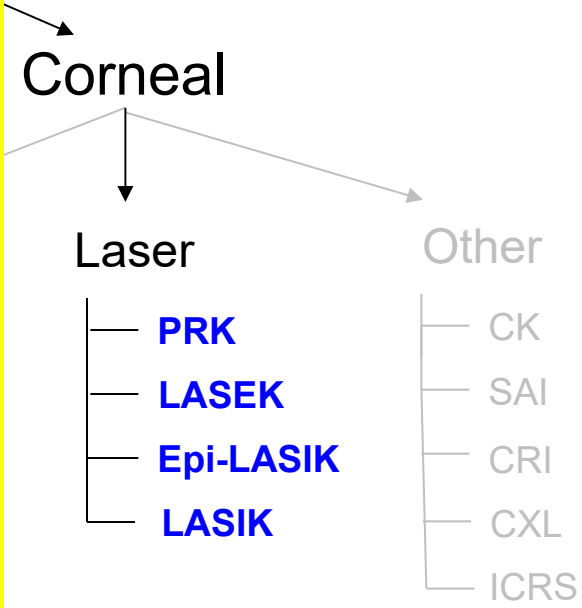

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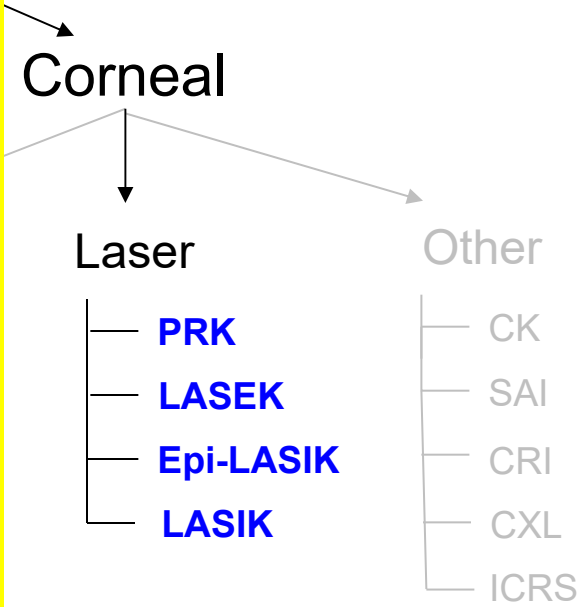

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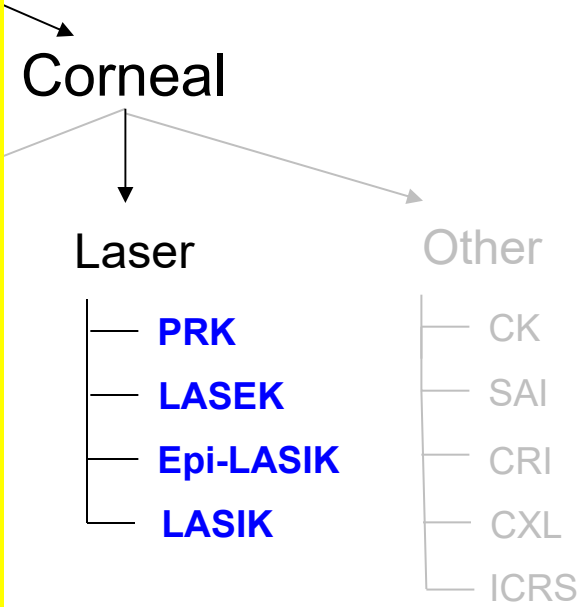

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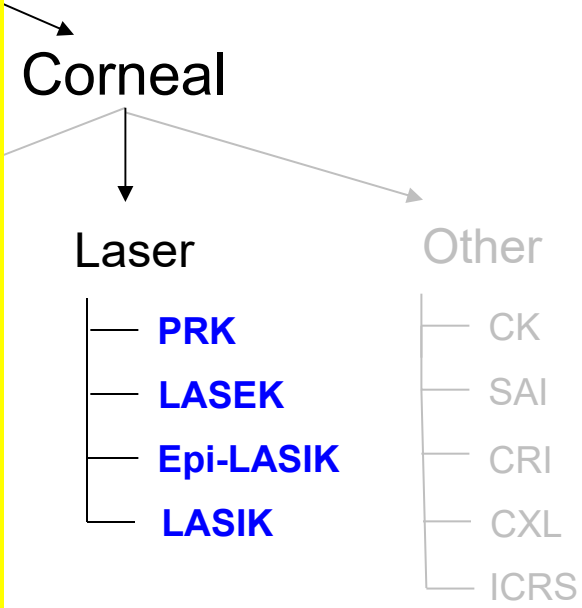

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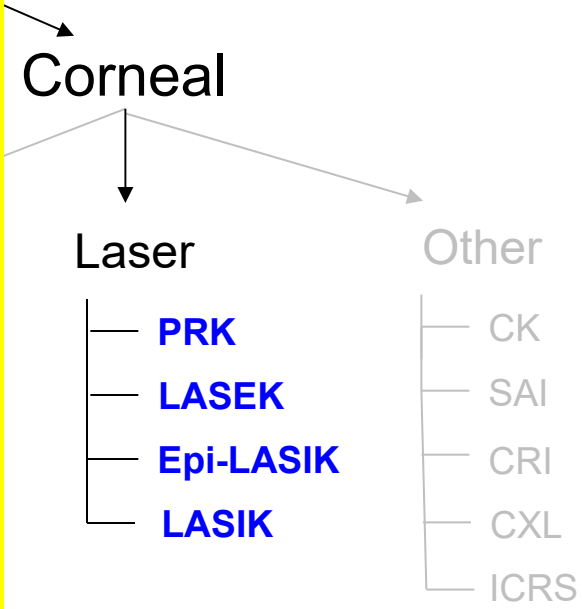

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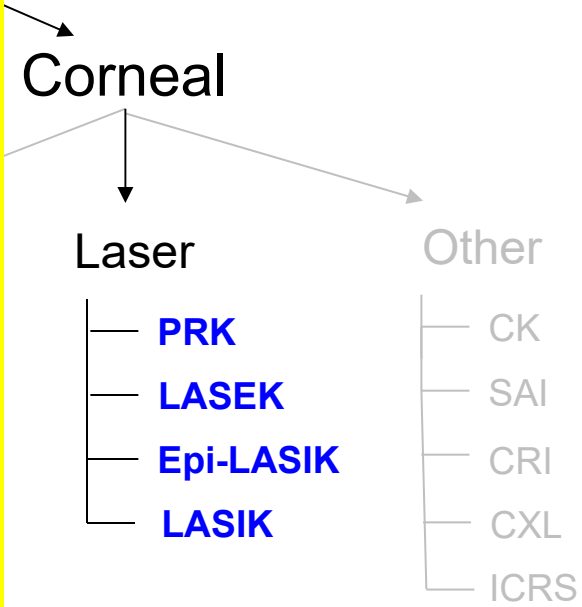

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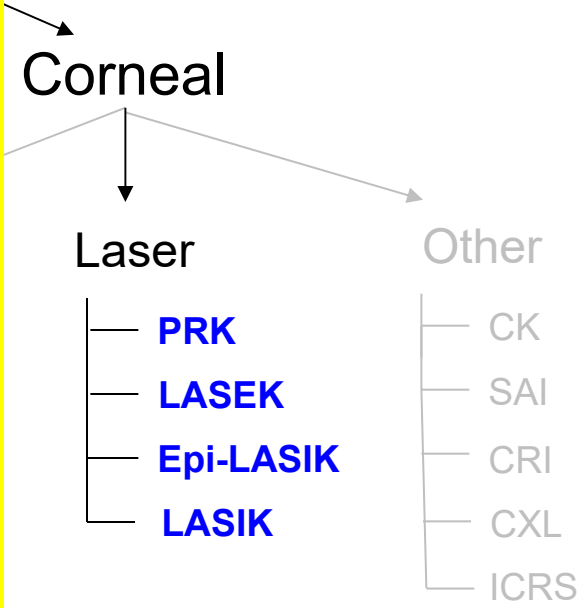

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*Is 193 nm in the UV range, or the infrared range?*
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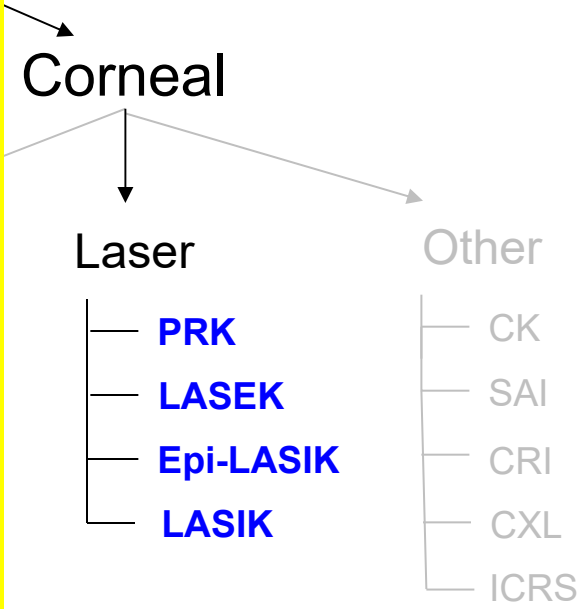
*Does light of this wavelength penetrate tissue?*



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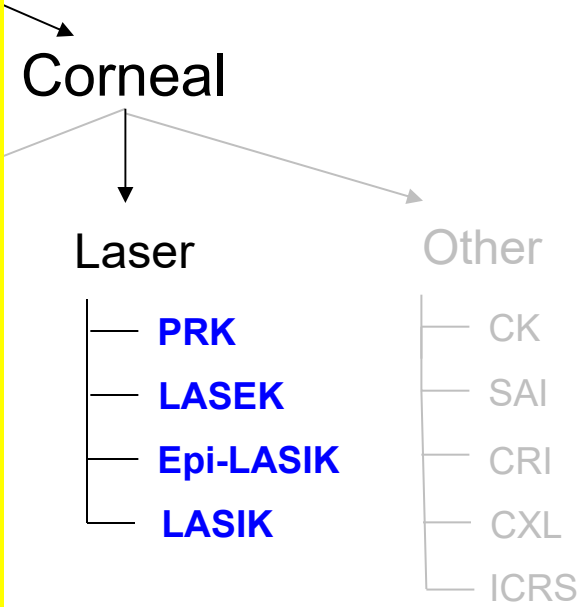

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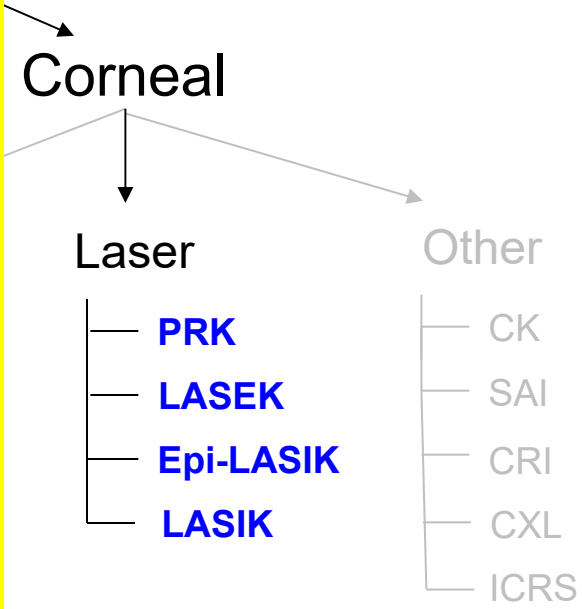

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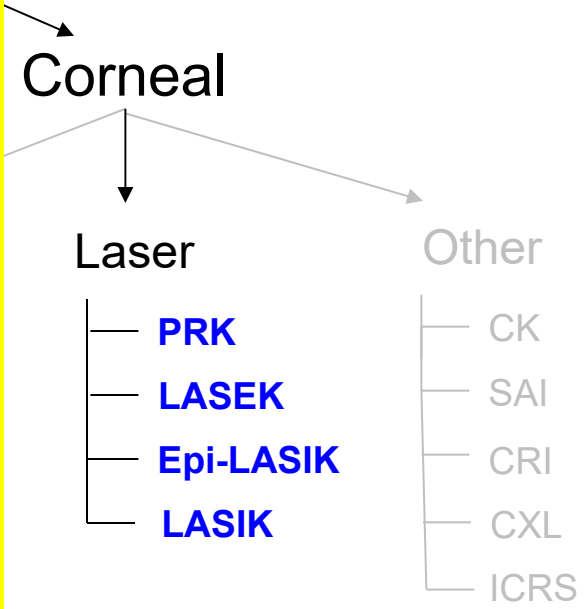

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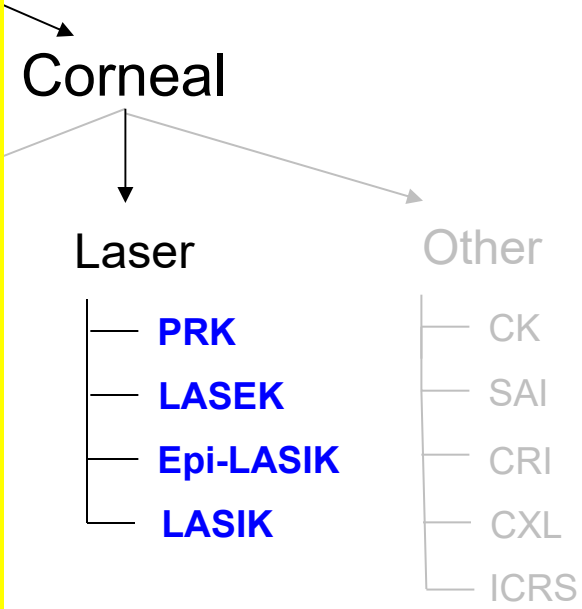

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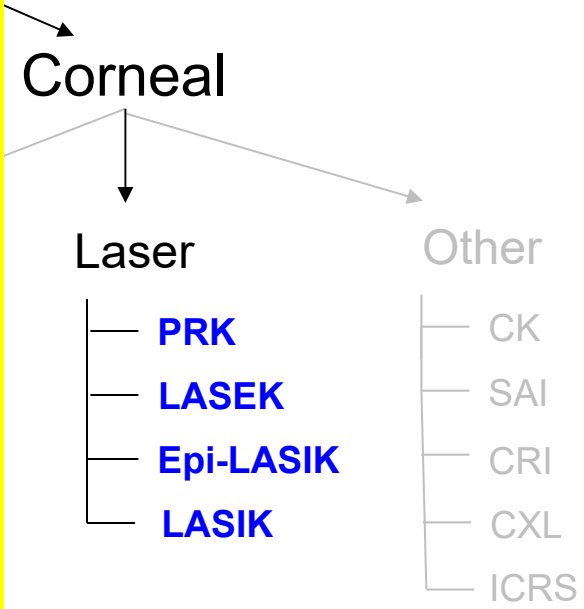

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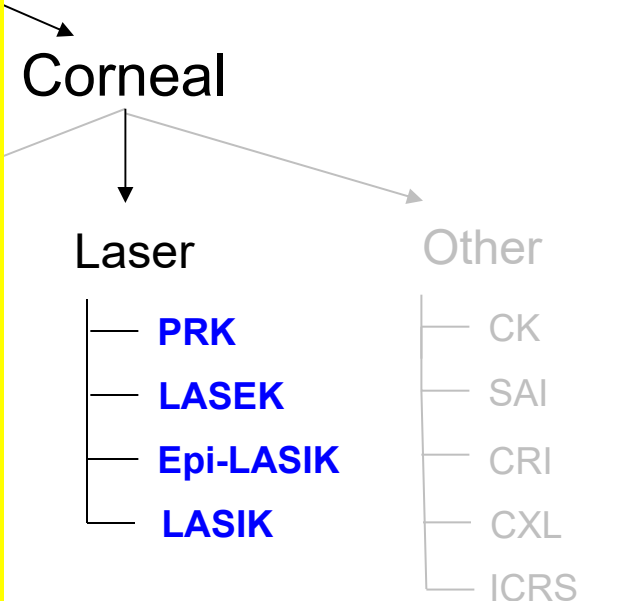


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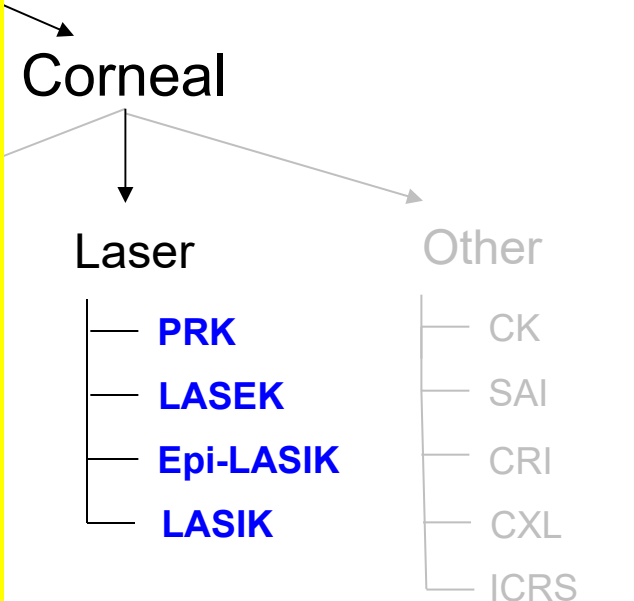


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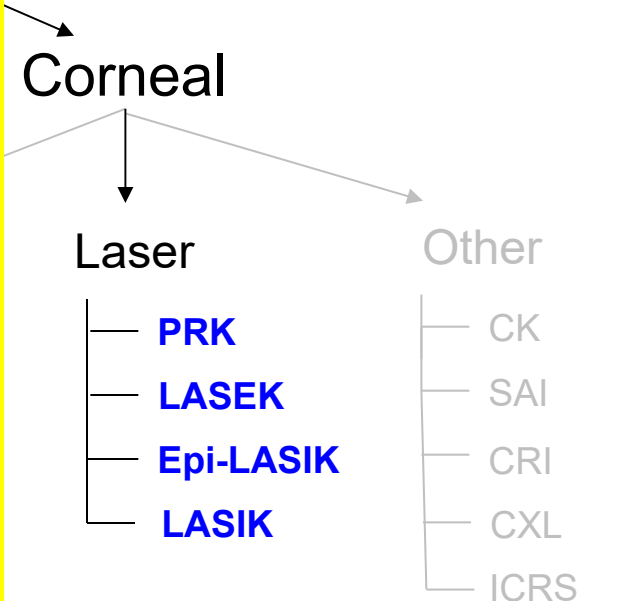


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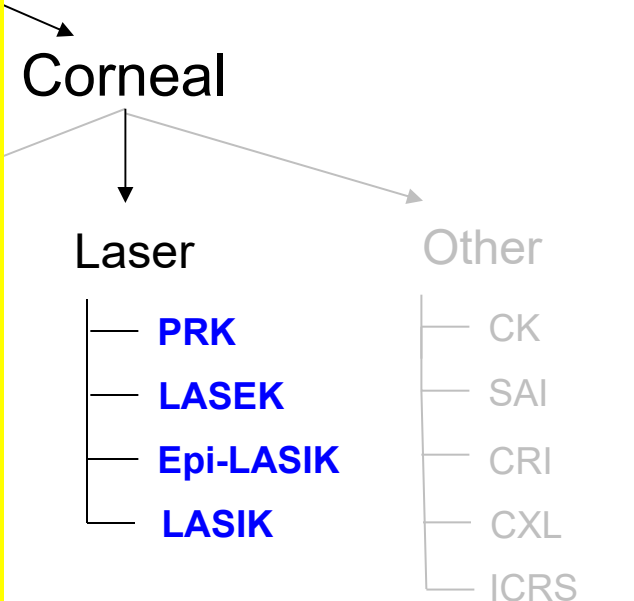


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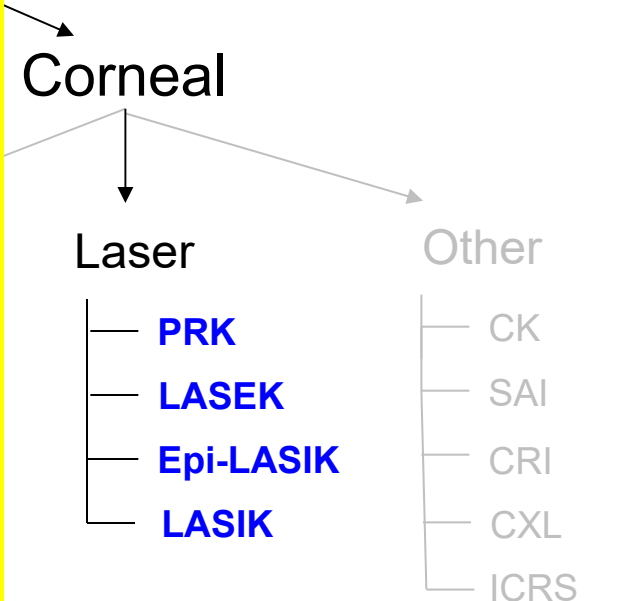


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*What is the diameter of the:*
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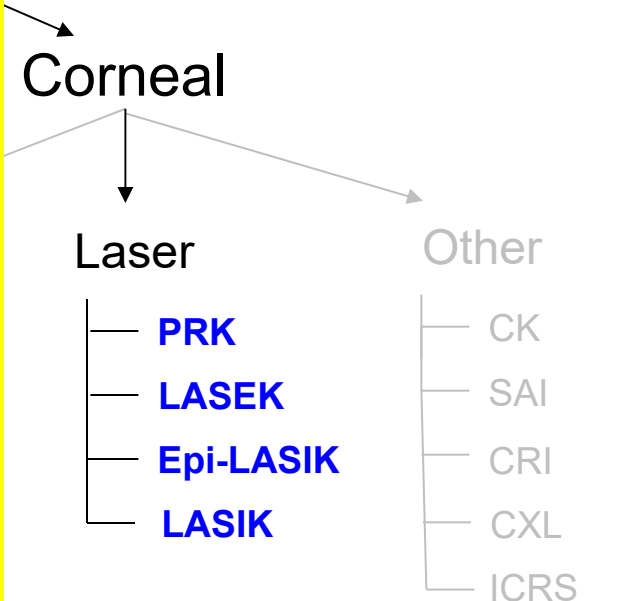


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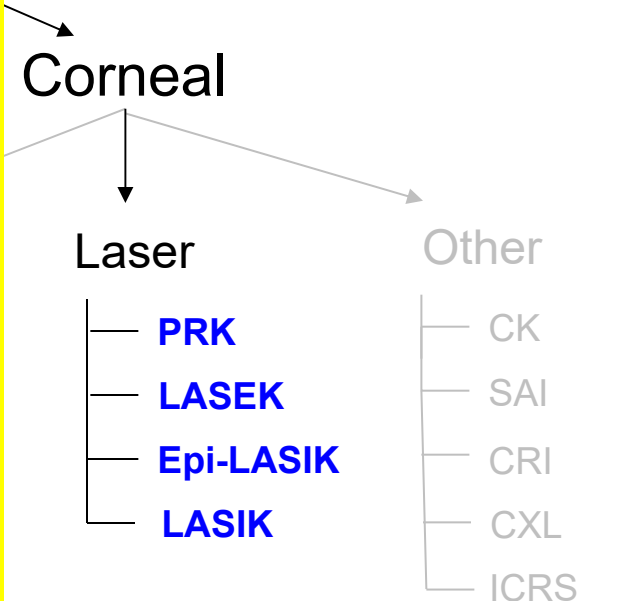


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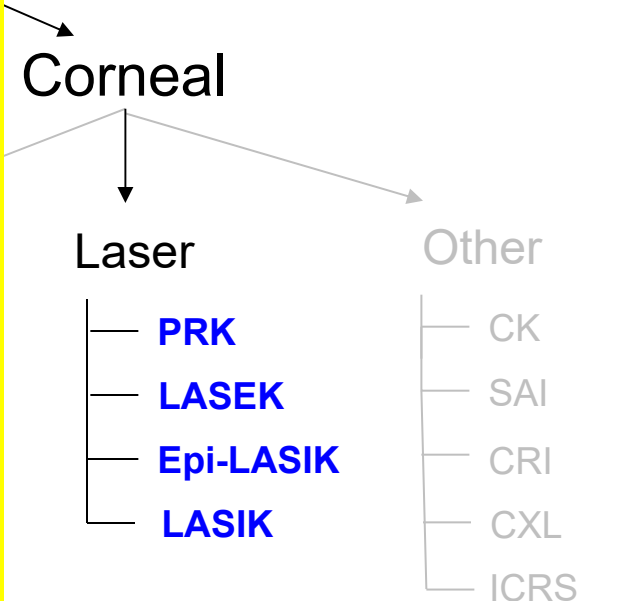


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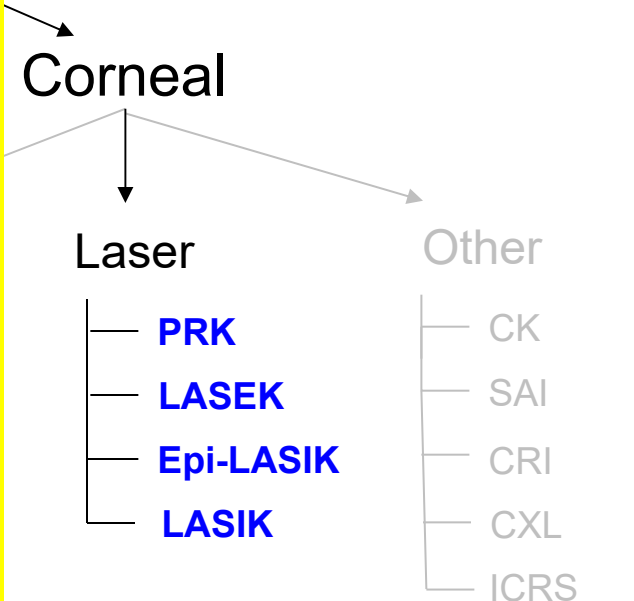


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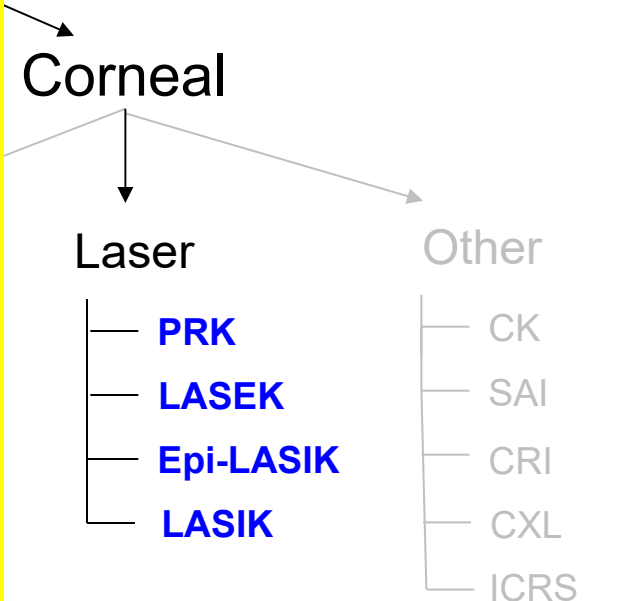


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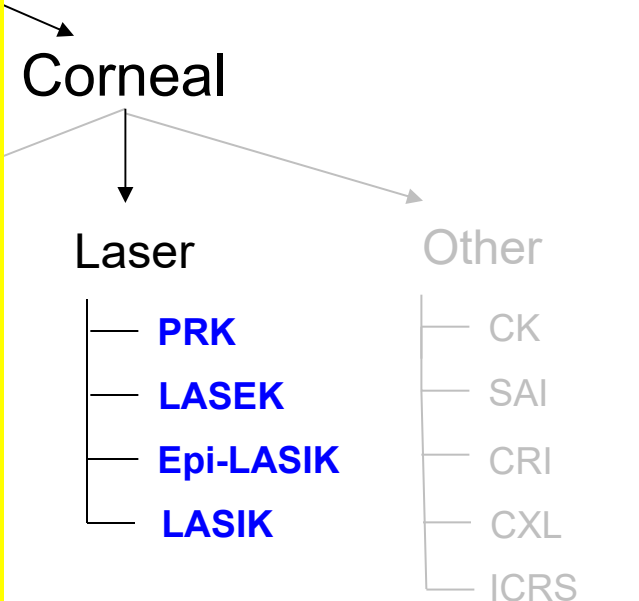


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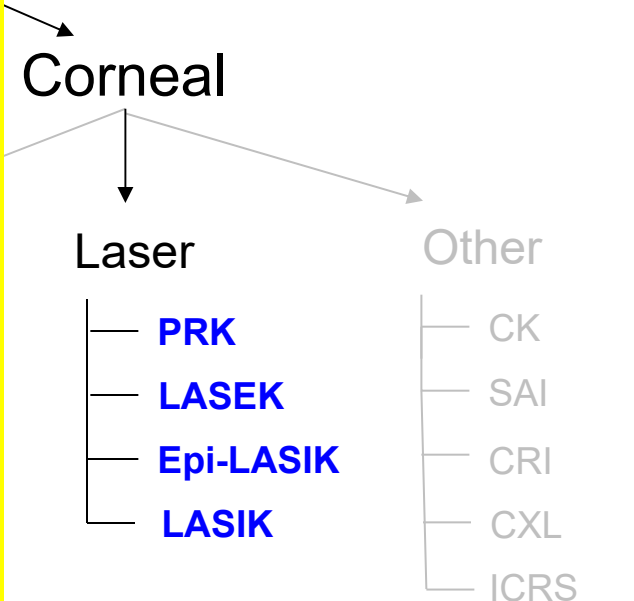


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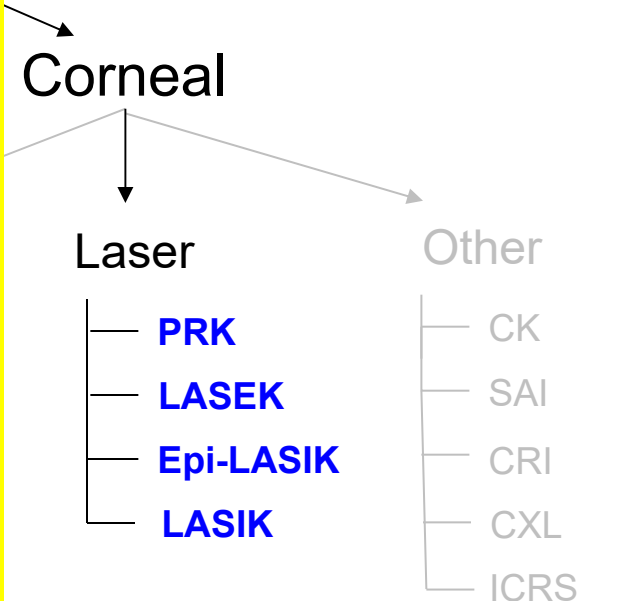


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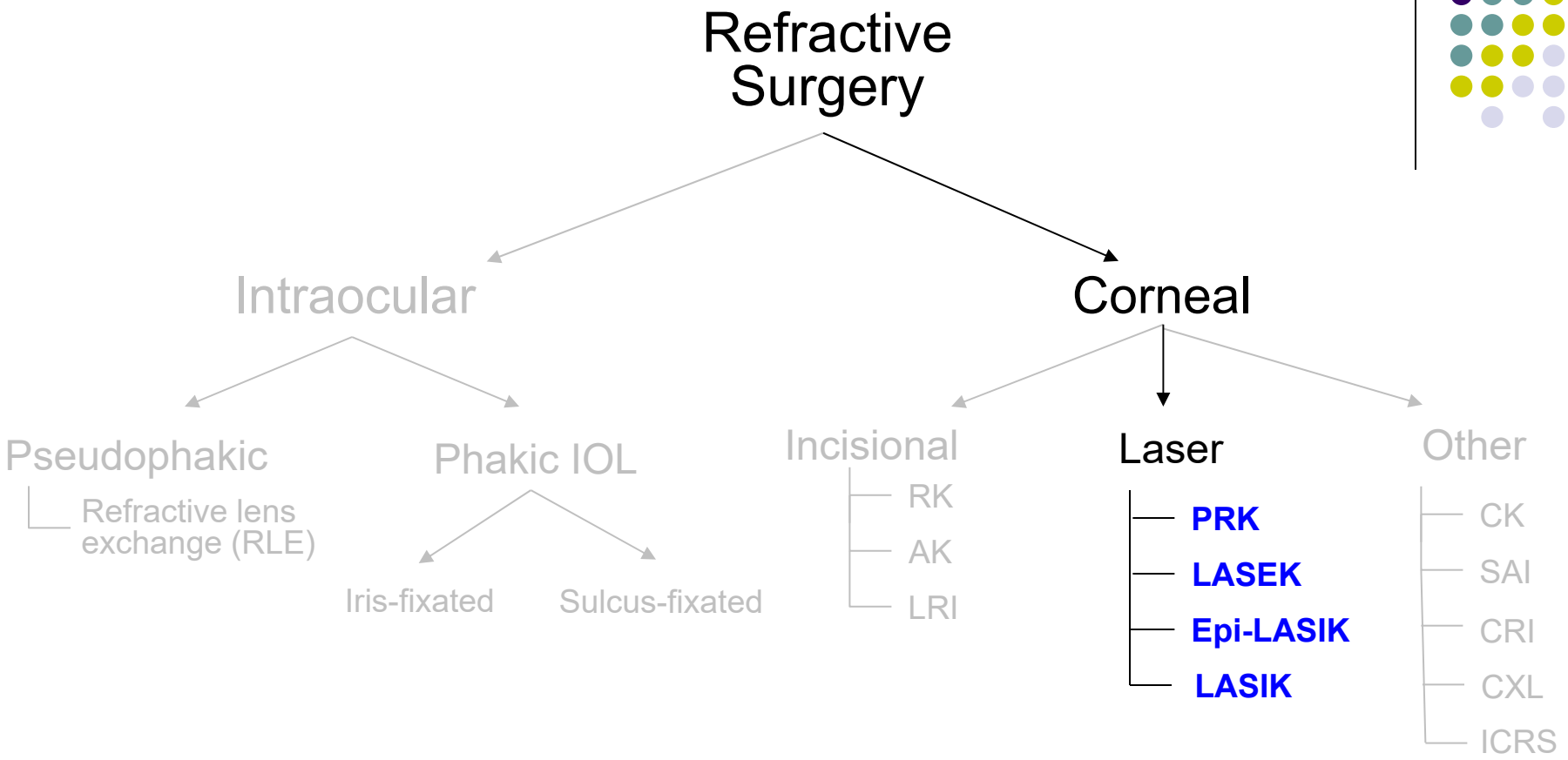


*In this context, what is* The Munnerlyn Formula?

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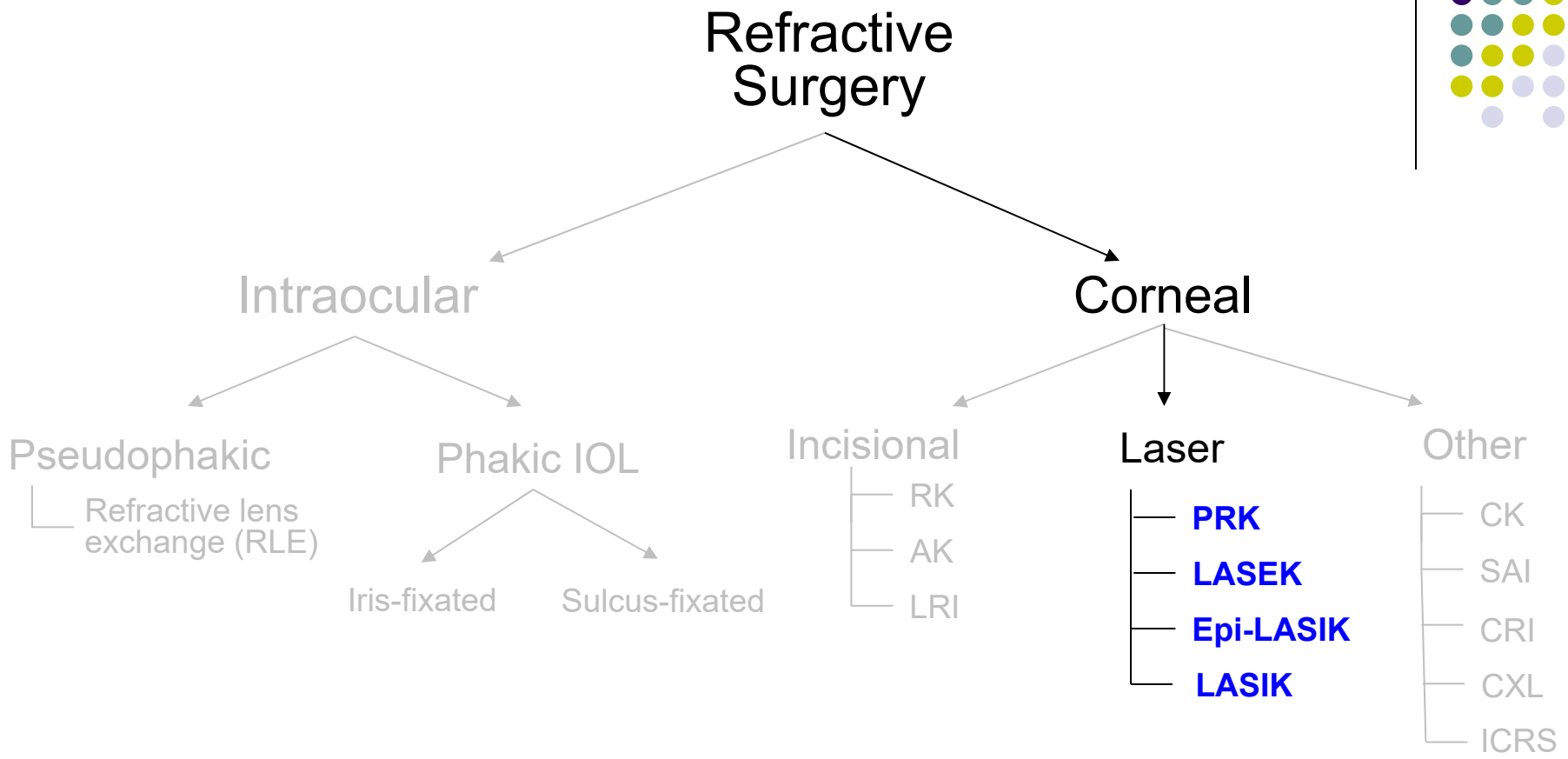


The Munnerlyn Formula:

$$\text{Ablation depth} = \frac{\text{Degree of Myopia in Diopters} \times (\text{the optical-zone diameter in mm})^2}{3}$$

# Photoablative Refractive Surgery

Refractive Surgery

*In words, what does the Munnerlyn formula tell us?*

**Epi-LASIK**

**LASIK**

CRI

CXL

ICRS

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Refractive Surgery

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The amount of central corneal tissue that must be removed to correct a given amount of myopia

- **Epi-LASIK**
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Refractive Surgery

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The amount of central corneal tissue that must be removed to correct a given amount of myopia

*What conundrum is highlighted by the Munnerlyn formula?*
The fact that that the amount of tissue that must be removed is a function of the square of the size of the optical zone

- **Epi-LASIK**
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- CRI
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The Munnerlyn Formula:

$$\text{Ablation depth} = \frac{\text{Degree of Myopia in Diopters} \times (\text{the optical-zone diameter in mm})^2}{3}$$

# Photoablative Refractive Surgery

Refractive Surgery

*In words, what does the Munnerlyn formula tell us?*
The amount of central corneal tissue that must be removed to correct a given amount of myopia

*What conundrum is highlighted by the Munnerlyn formula?*
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**6 mm**



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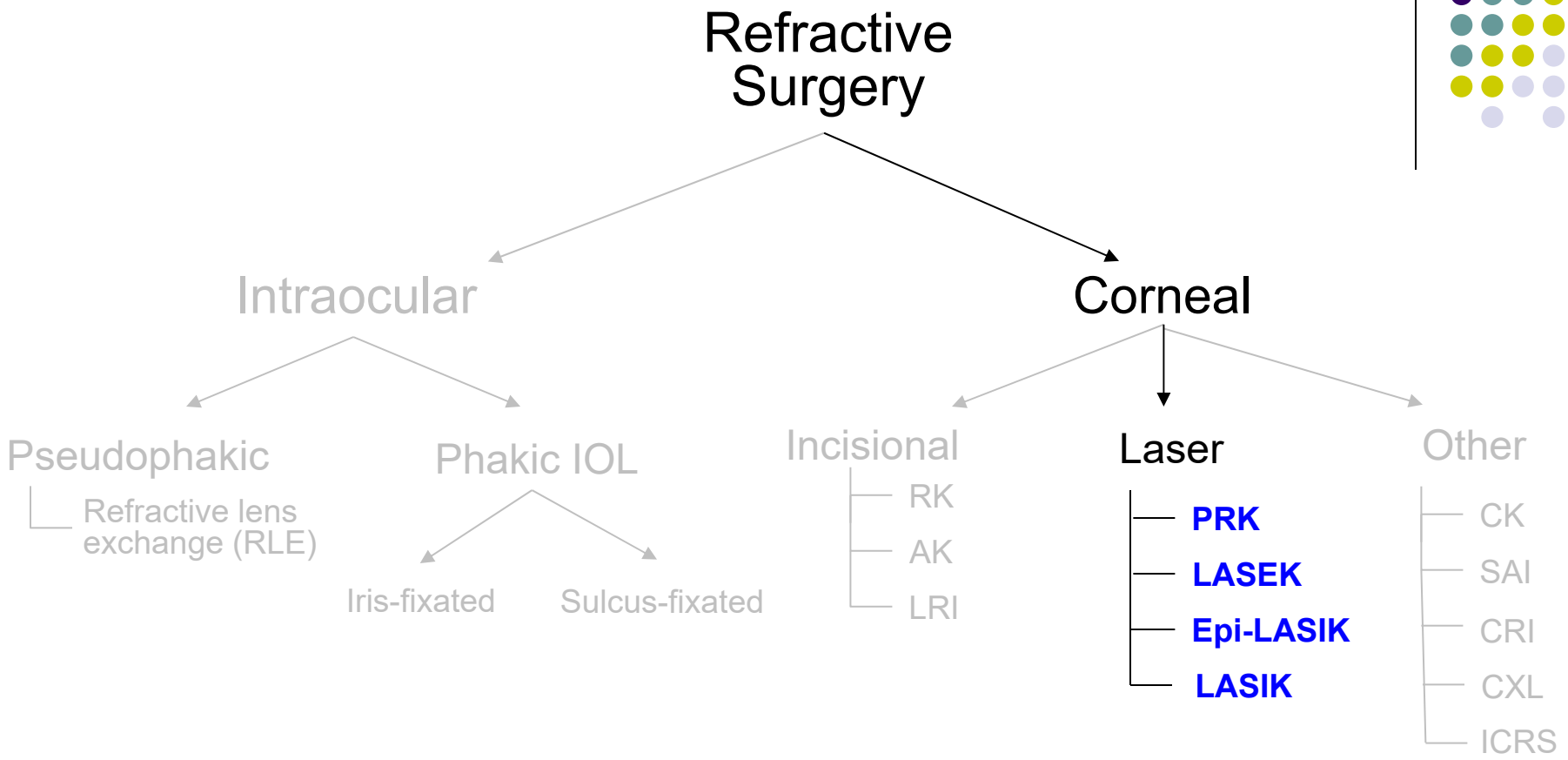


*Does the Munnerlyn formula apply to* **hyperopic** *photoablative refractive surgery?*

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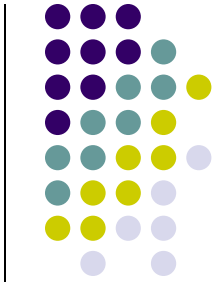

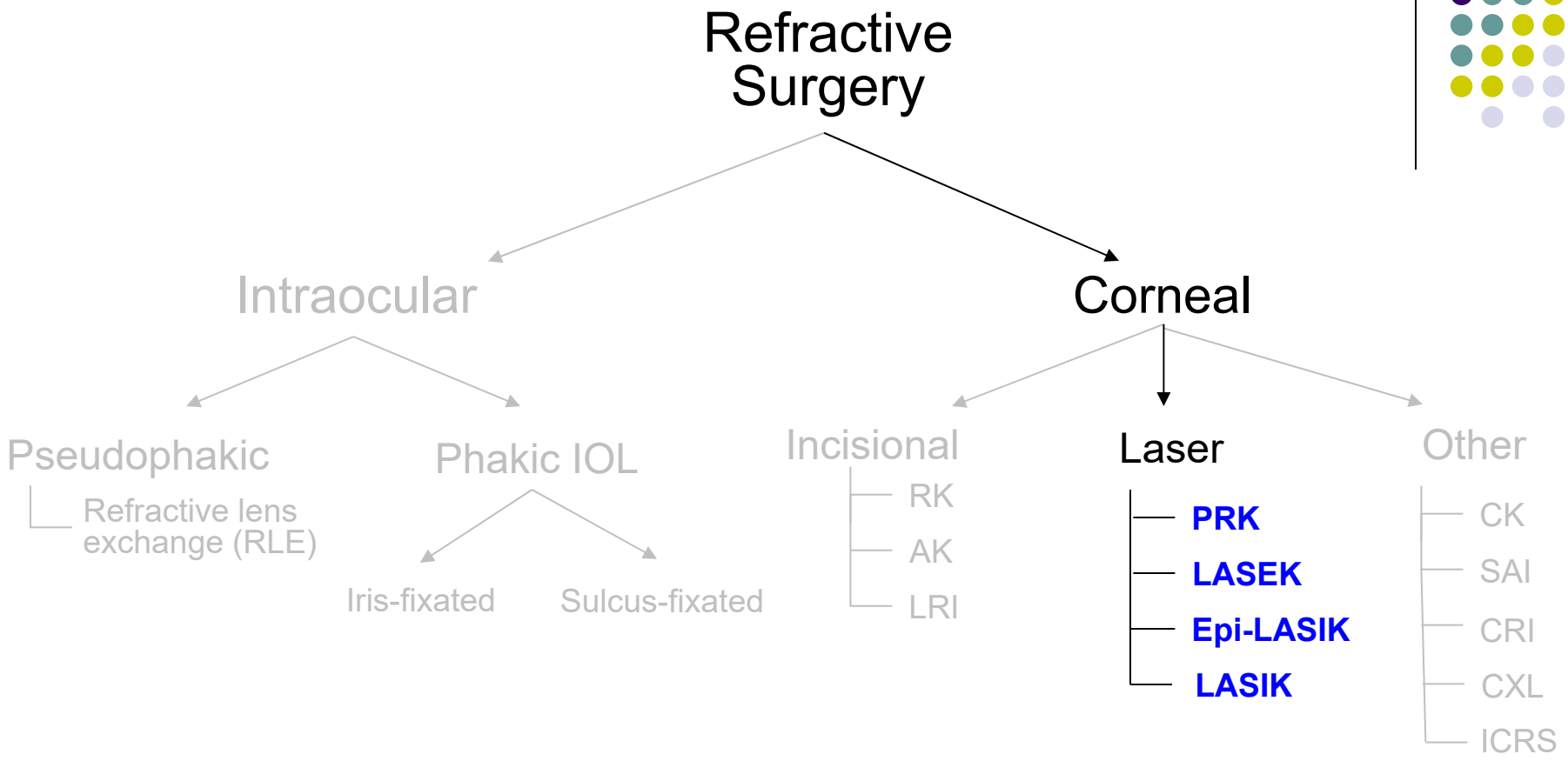


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The Munnerlyn Formula*:*

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hyperopia ^

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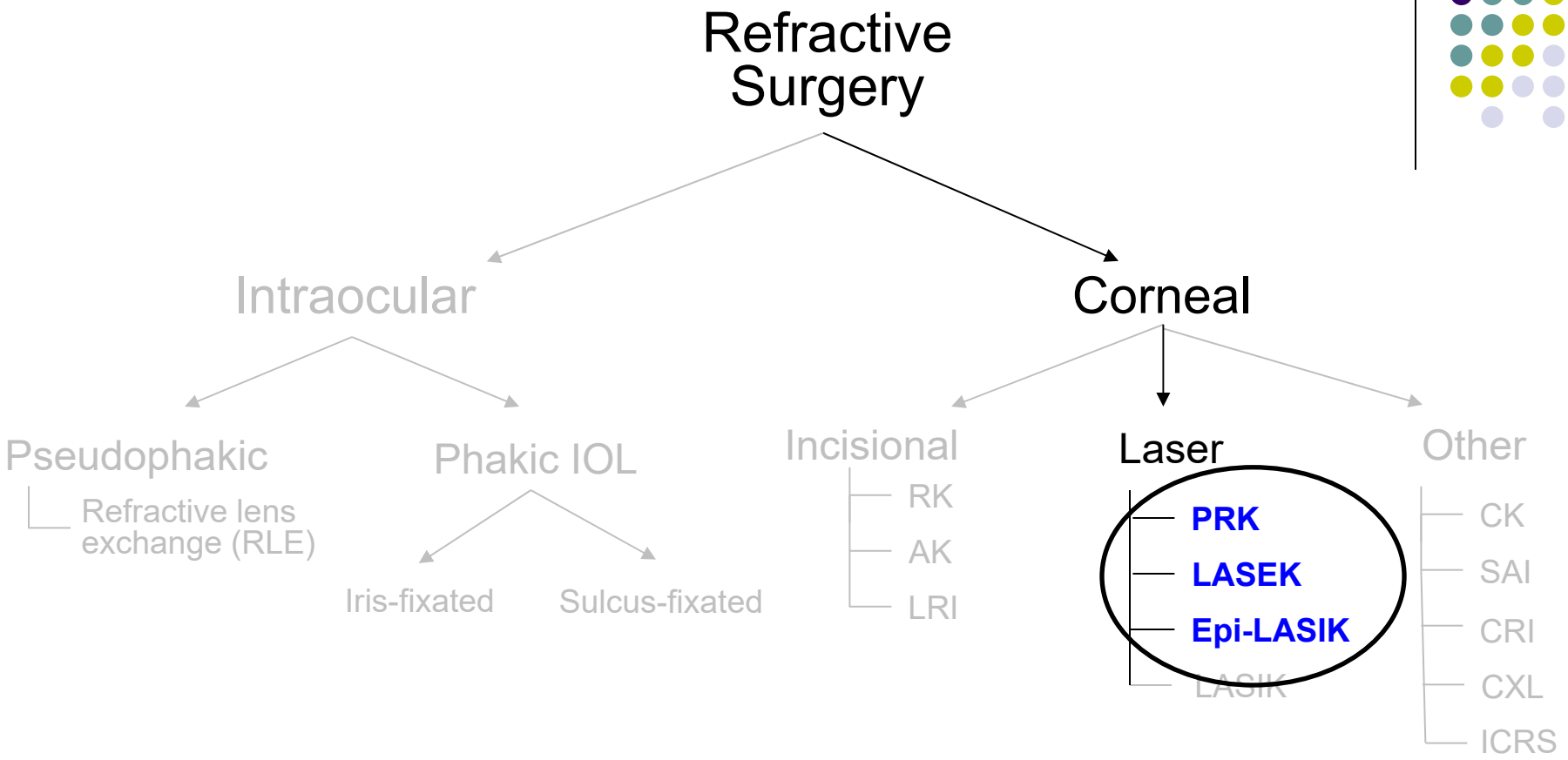


*How do the surface-ablation procedures differ from one another?*

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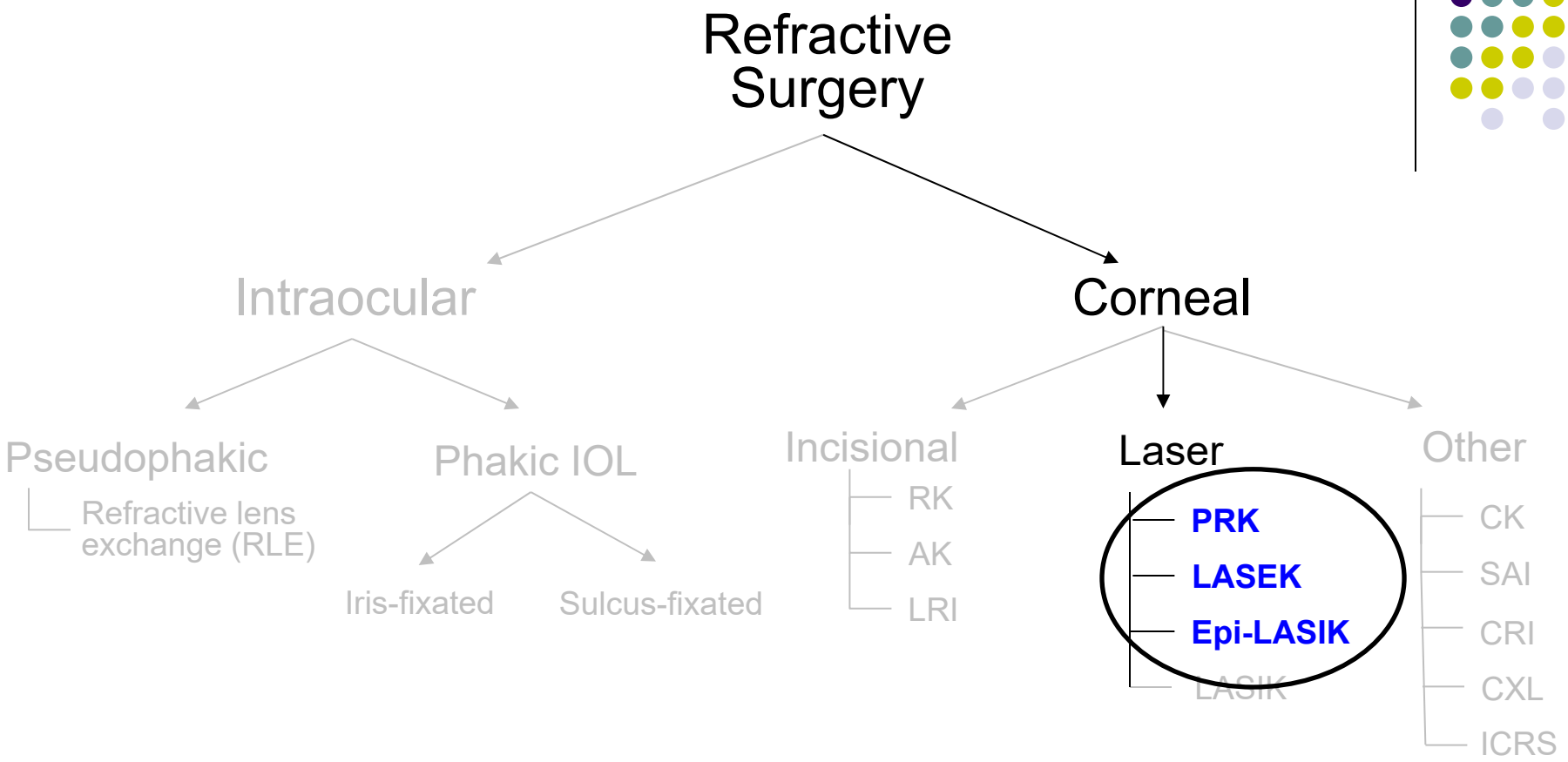


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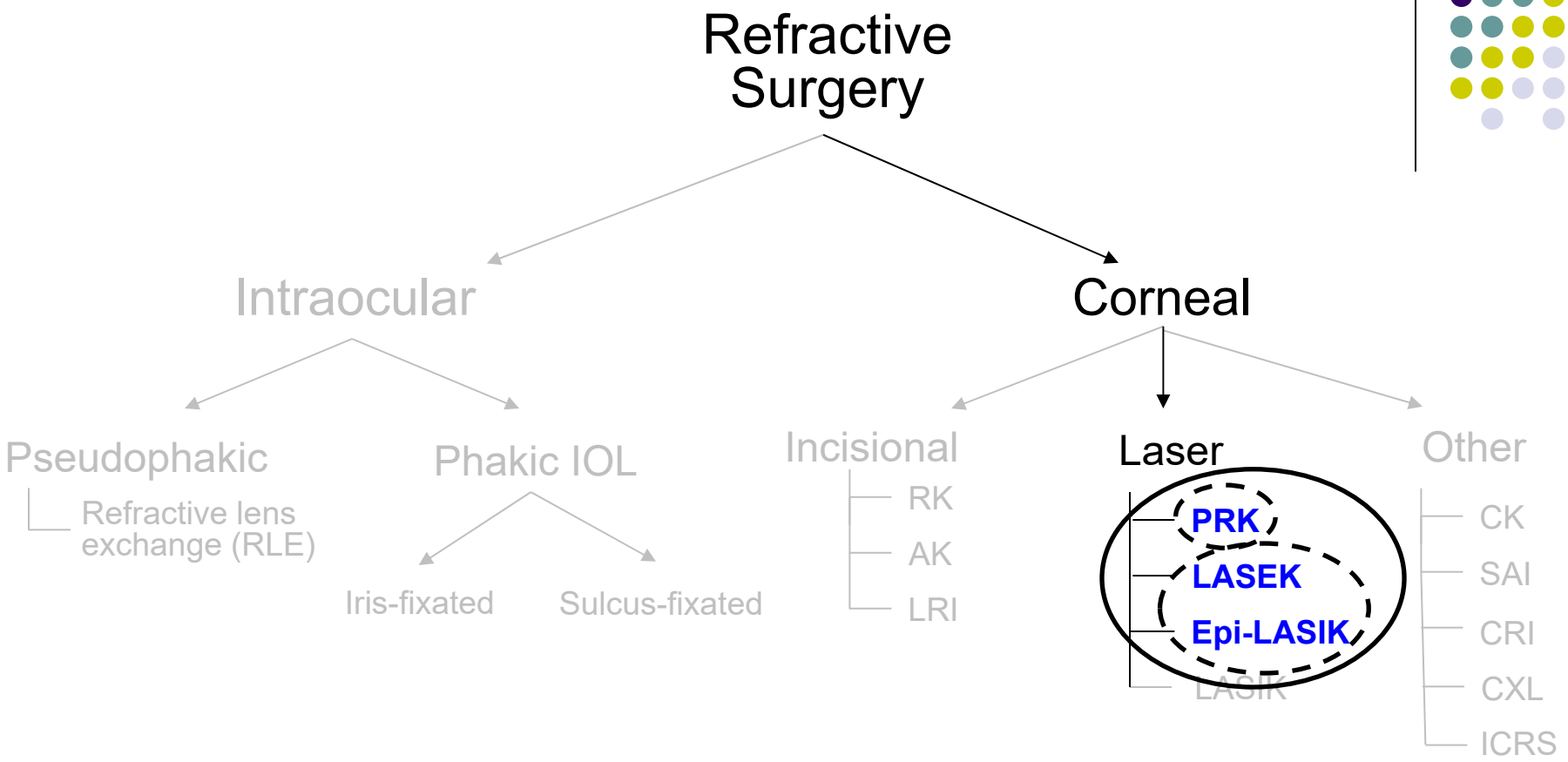


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*In what fundamental way do LASEK and epi-LASIK differ from PRK?*

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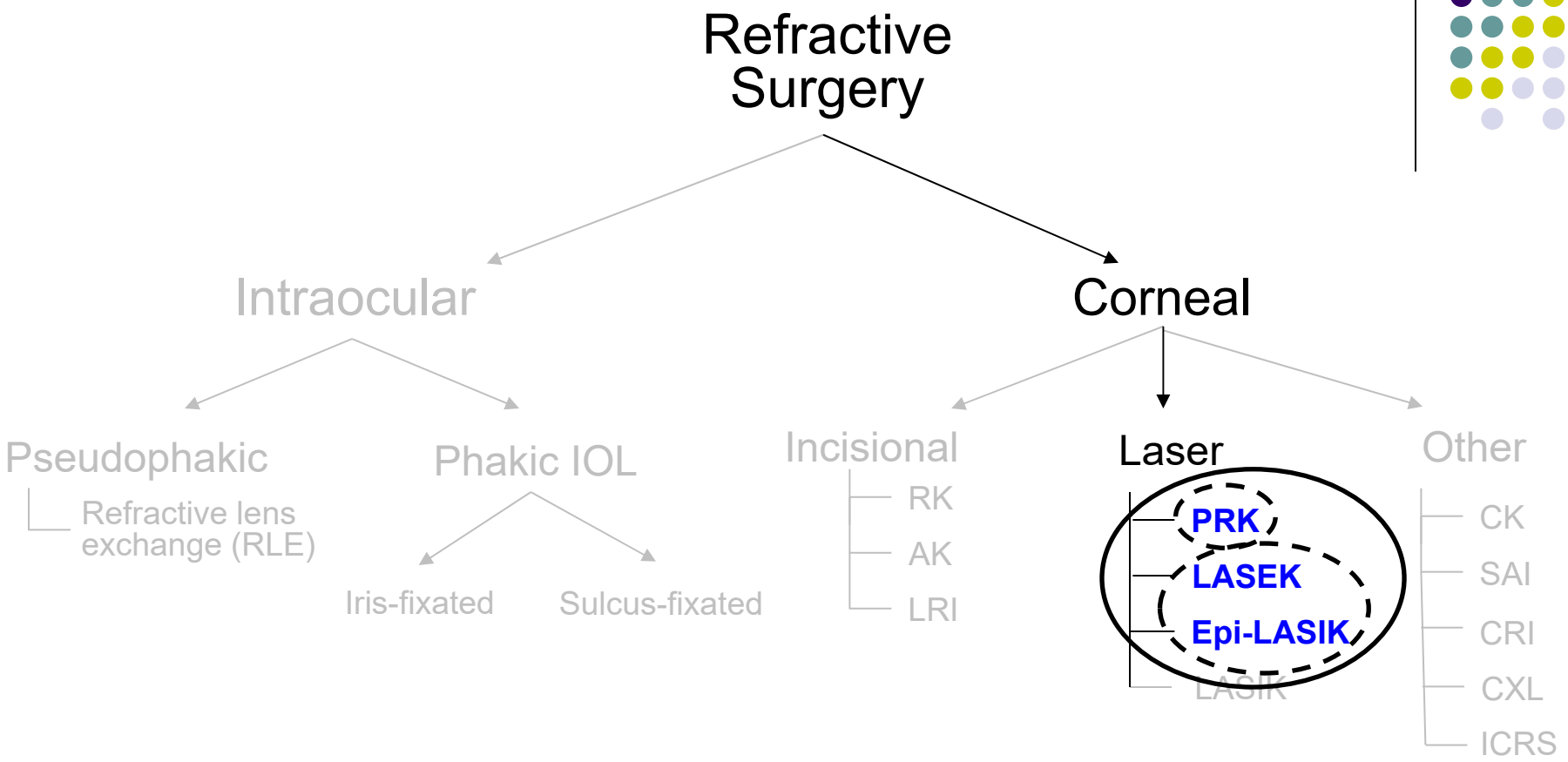


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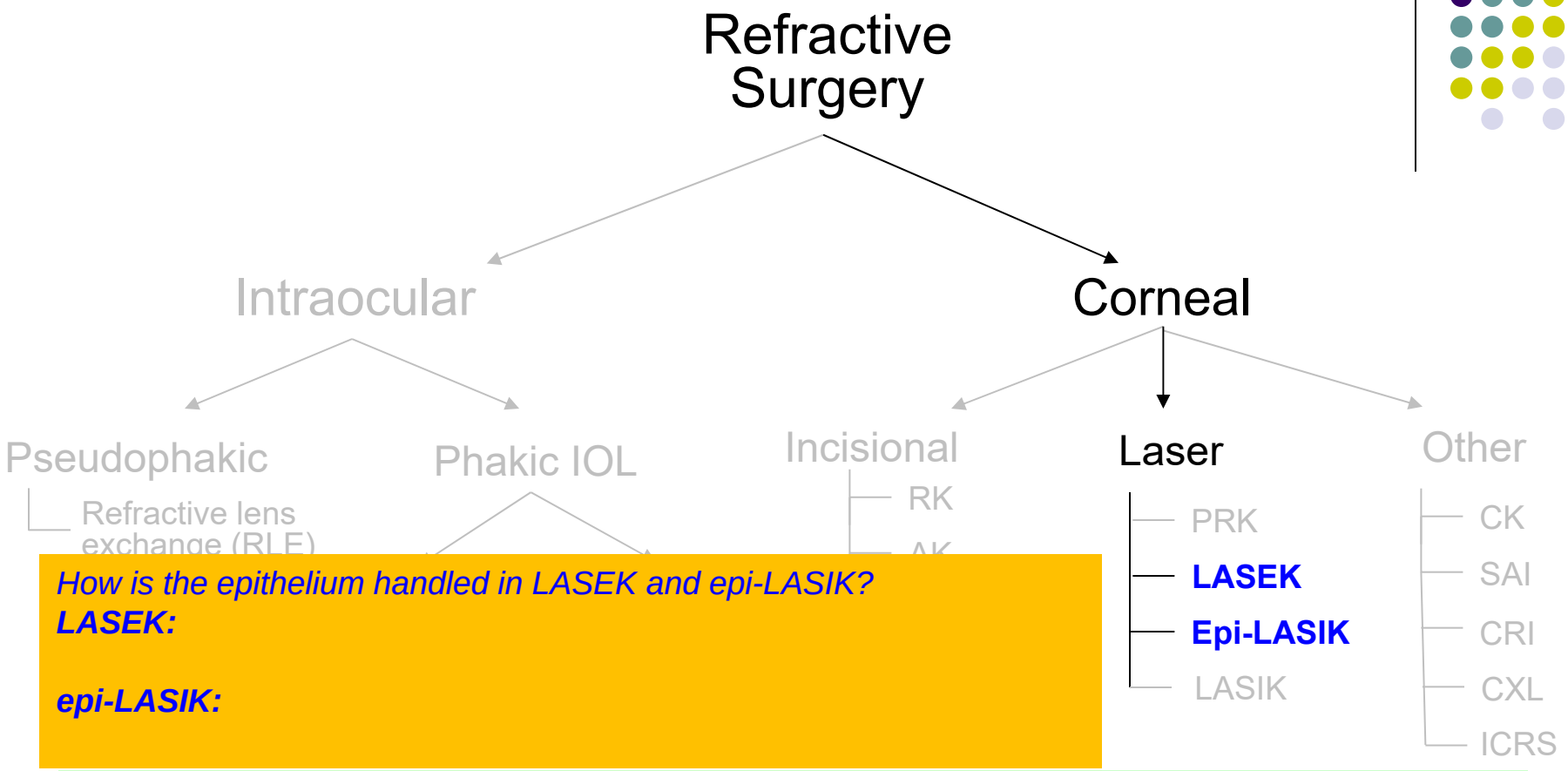


*How is the epithelium handled in LASEK and epi-LASIK?*

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***epi-LASIK:***

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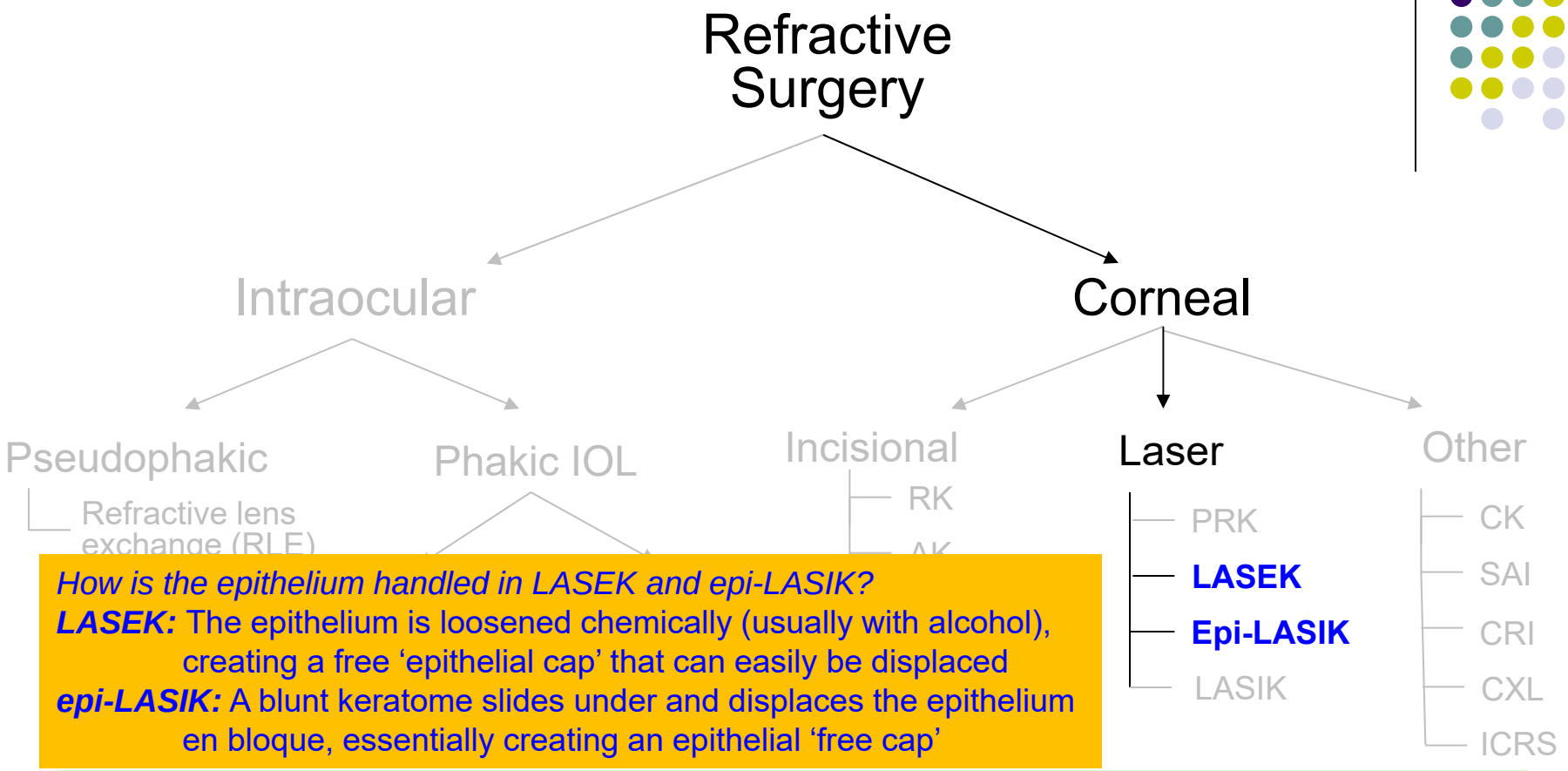


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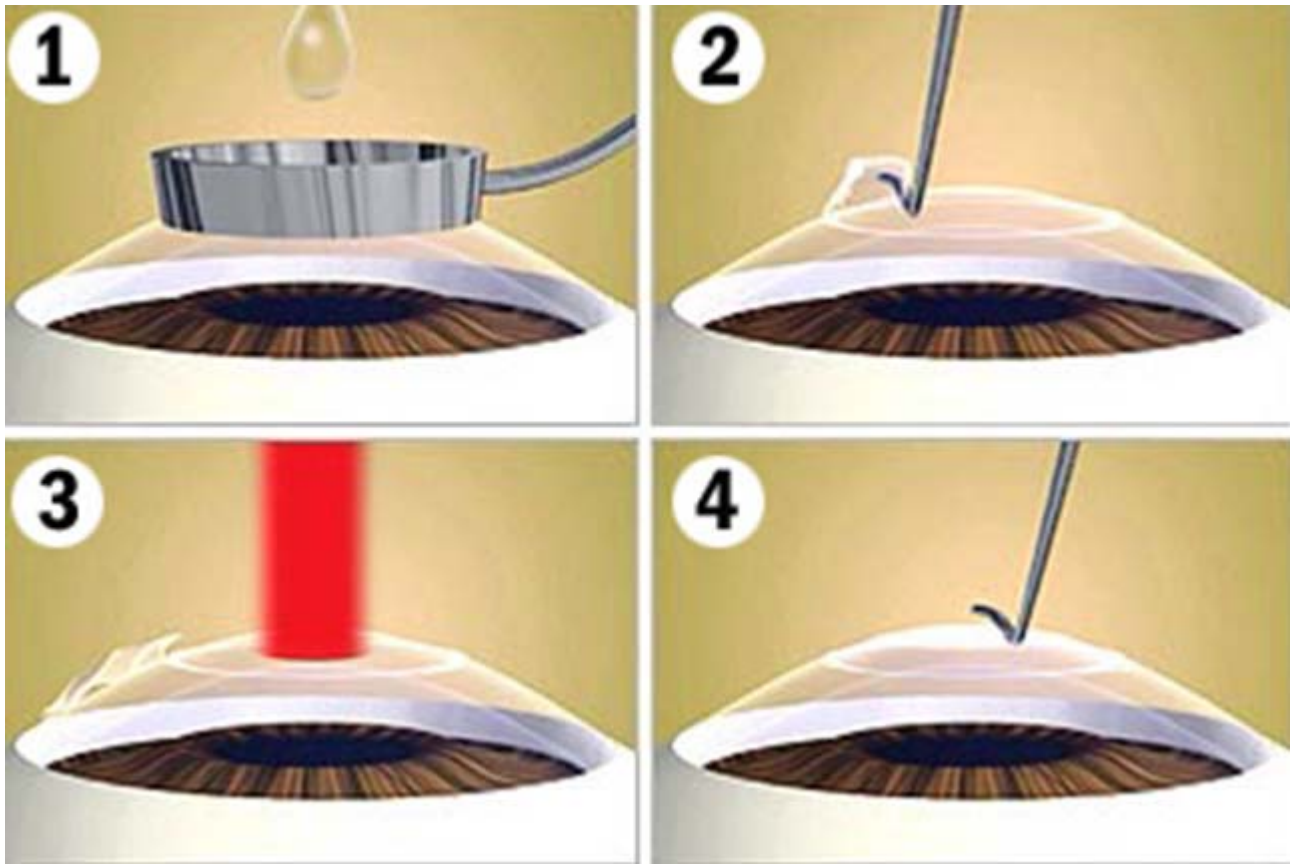
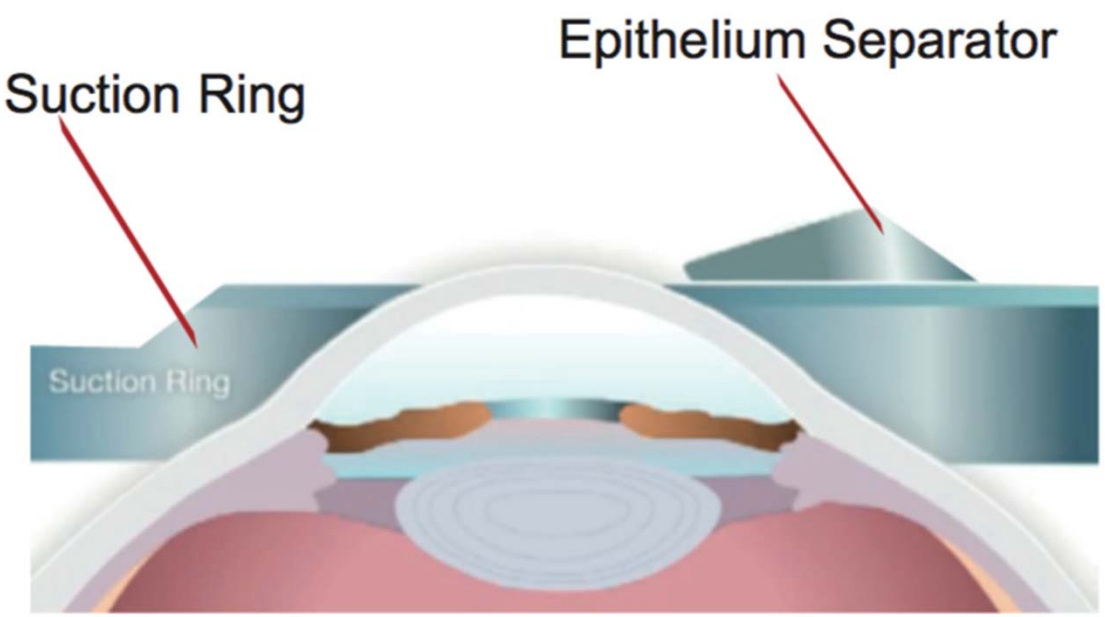
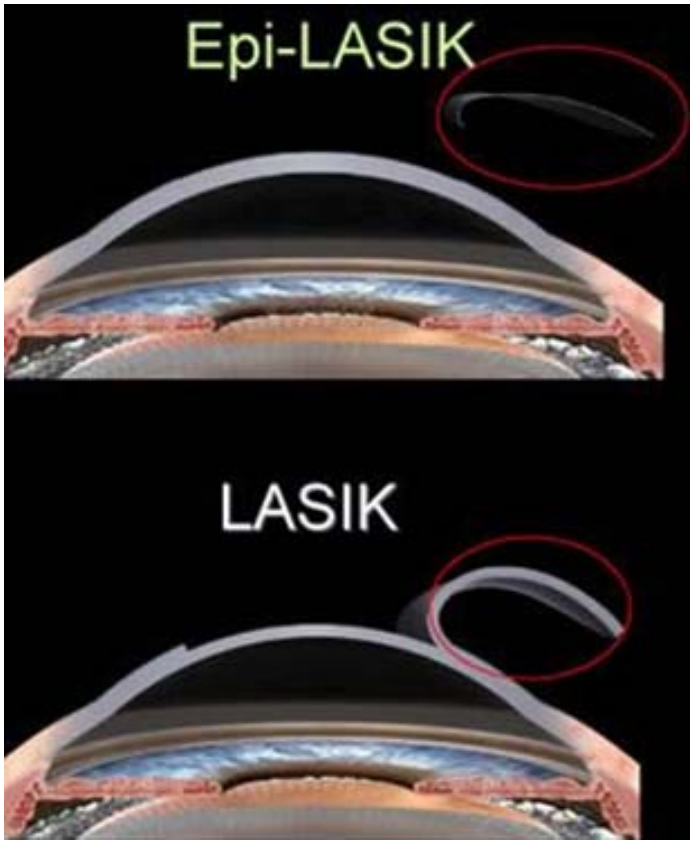


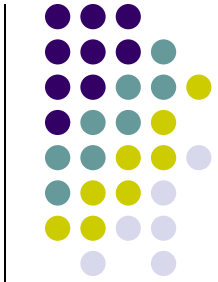

LASEK

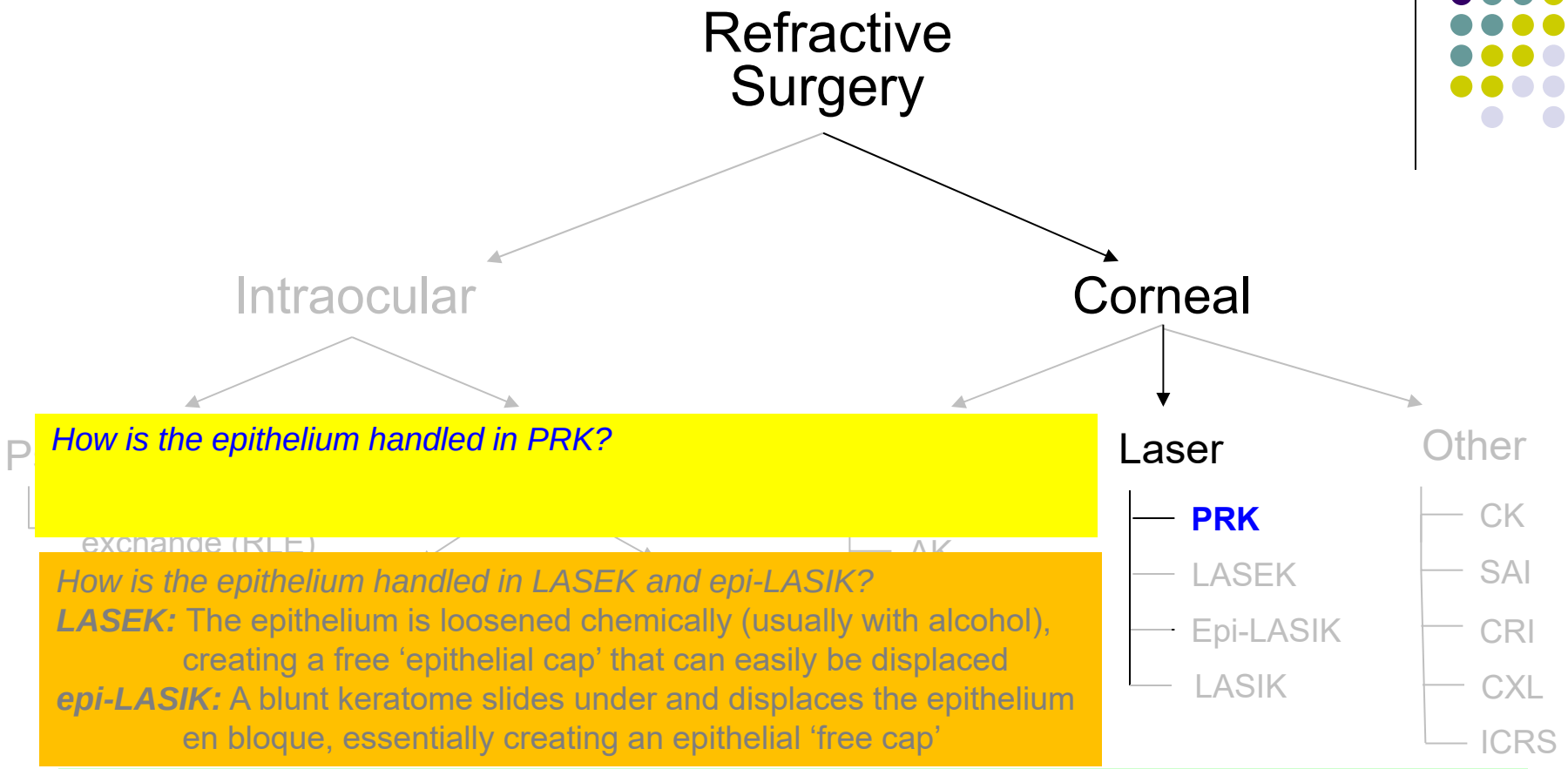

Epithelium Separator
Suction Ring
Suction Ring


Epi-LASIK
LASIK

Epi-LASIK

# Photoablative Refractive Surgery



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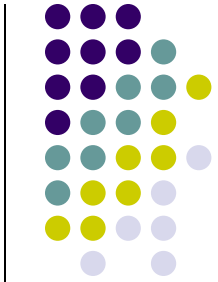

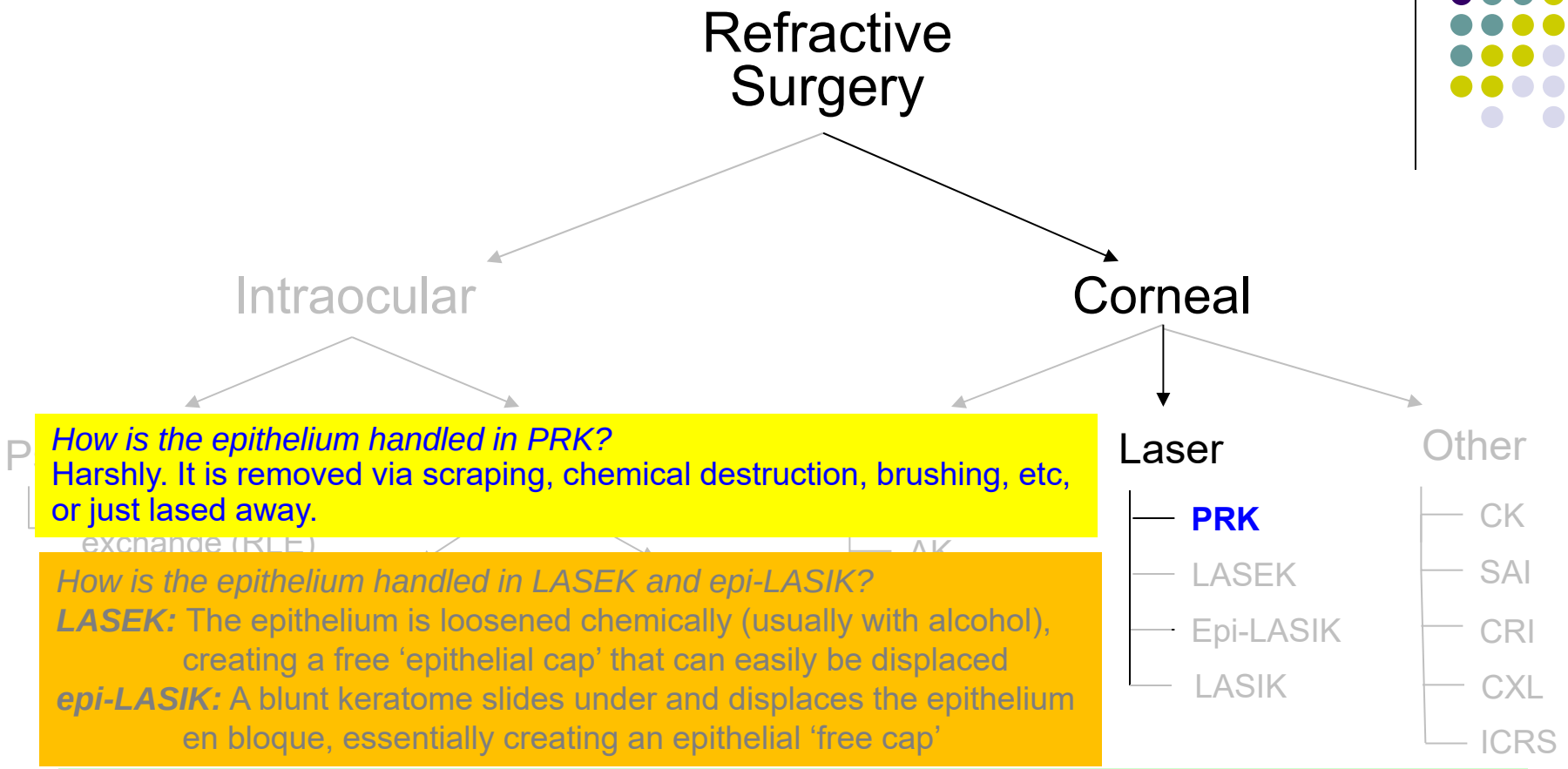


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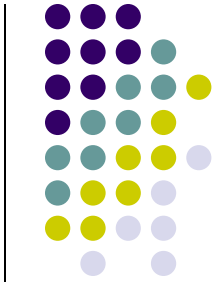

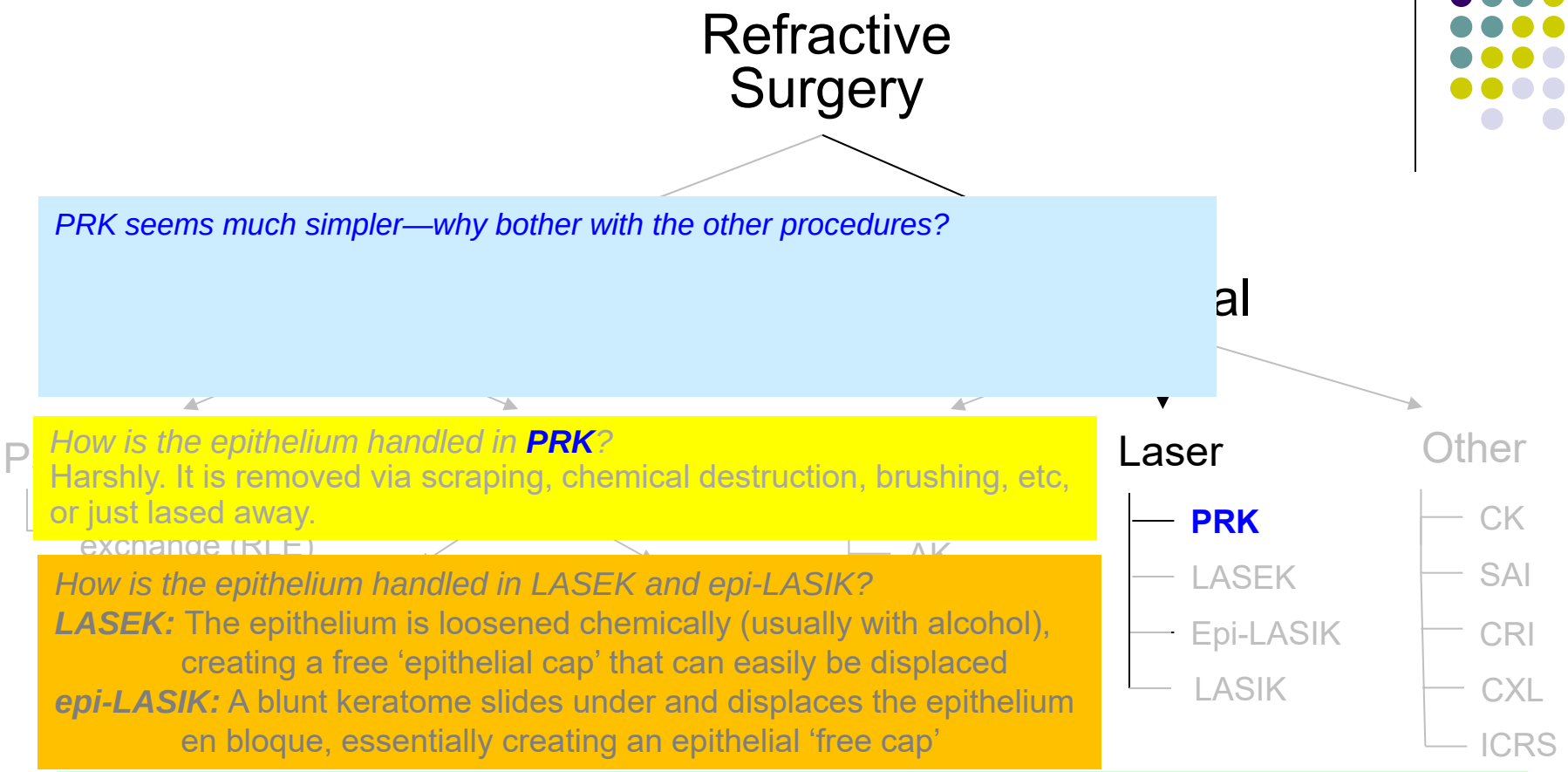


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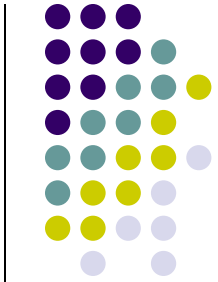

Refractive Surgery

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al

P

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exchange (RLE)

AK

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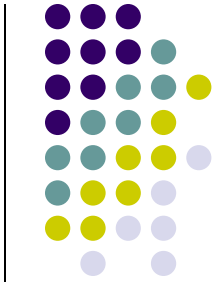

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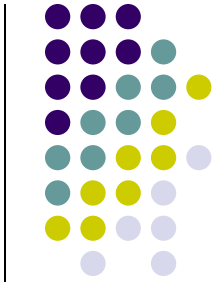

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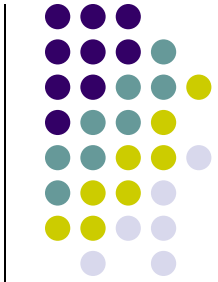

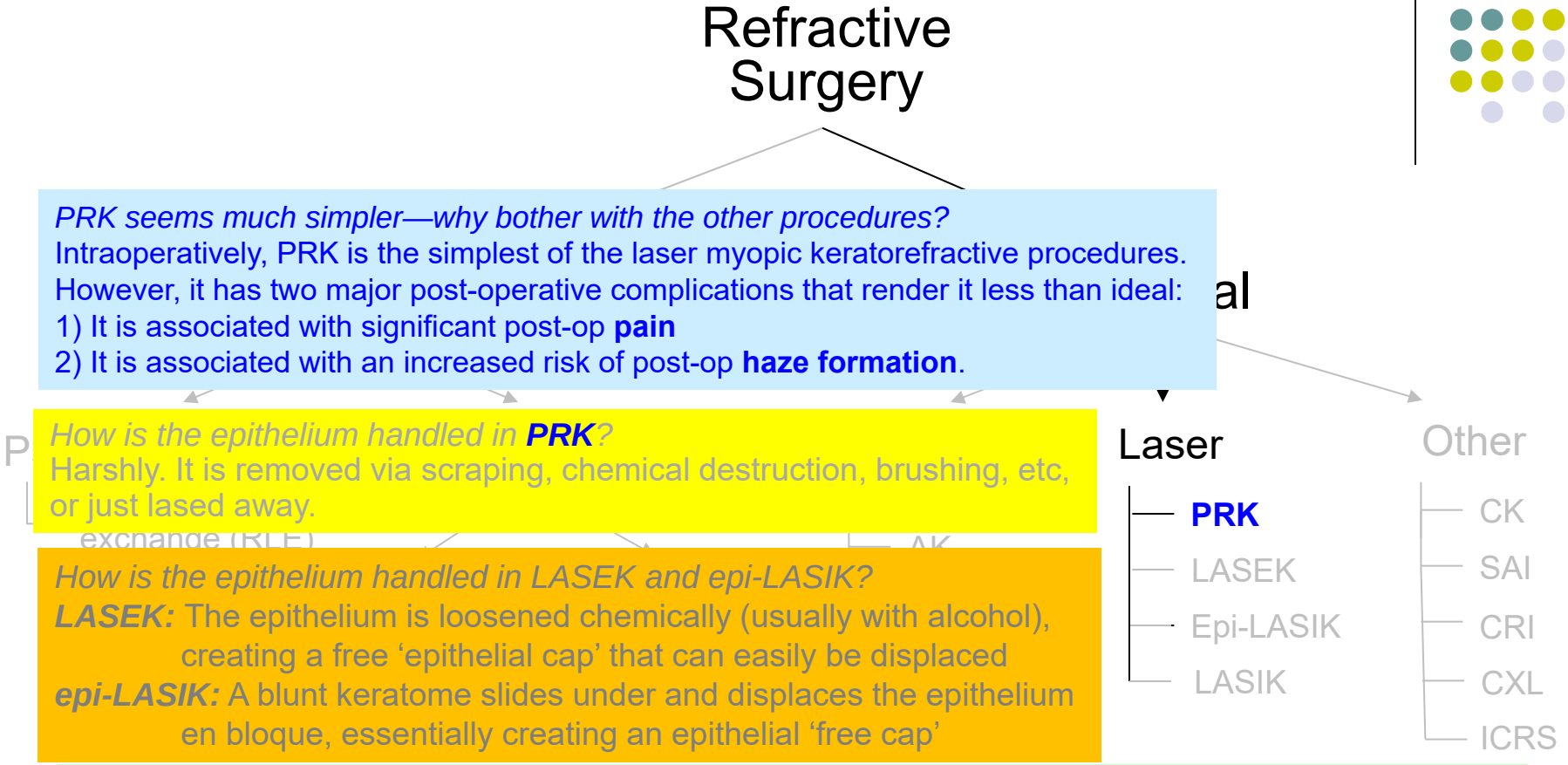


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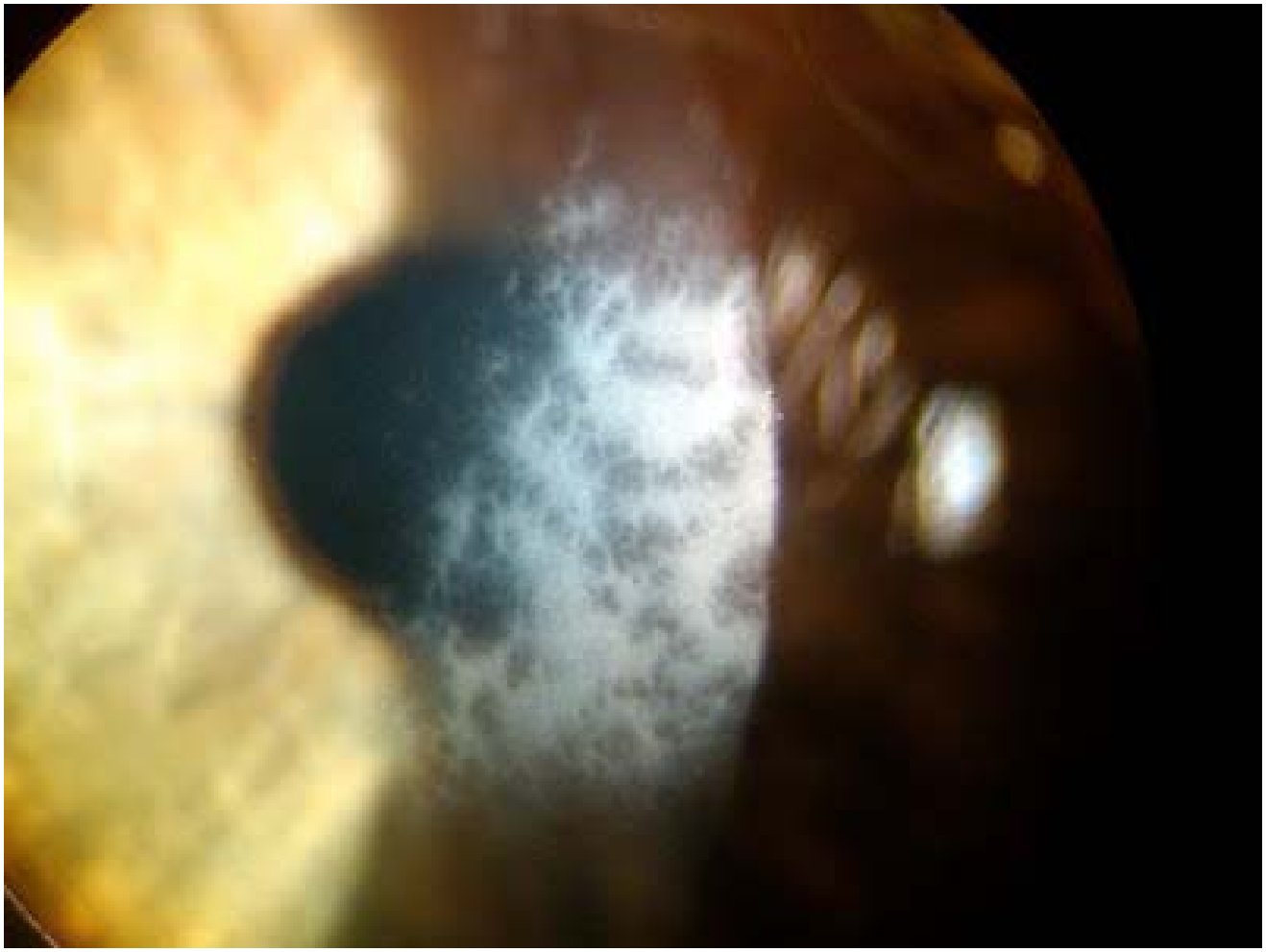

Post-PRK haze

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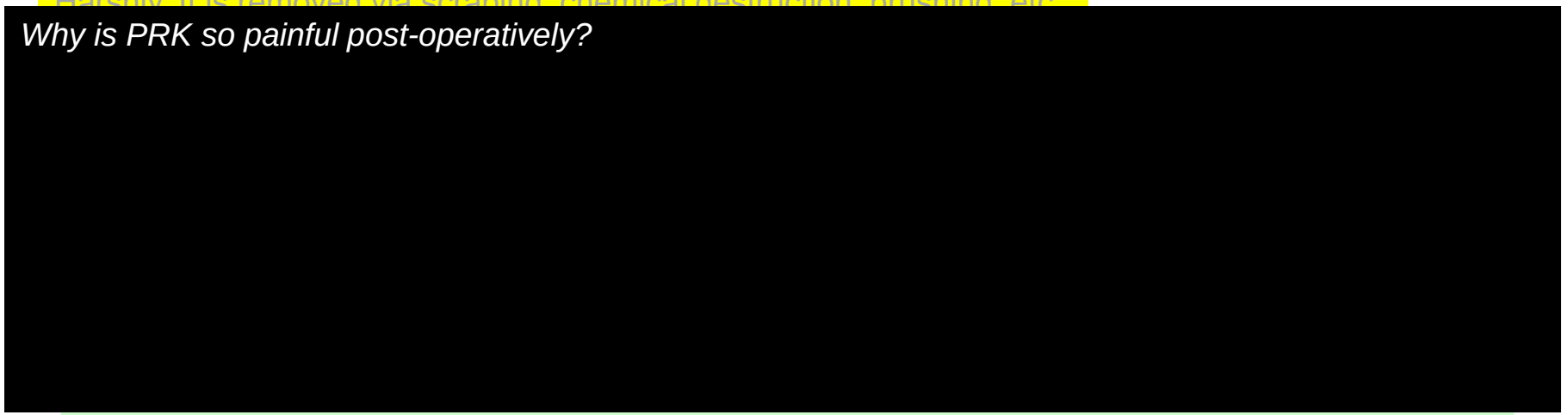
Laser

Other

*Why is PRK so painful post-operatively?*



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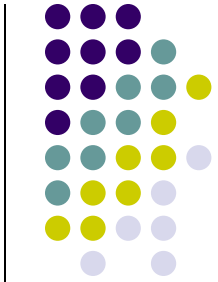

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Other

*Why is PRK so painful post-operatively?*
Think about it--essentially, the surgeon is creating a large central epithelial defect, an excruciating condition that takes several days to resolve

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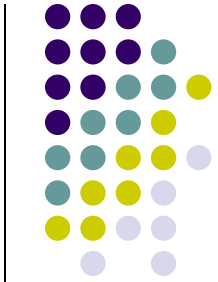

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*How is the epithelium handled in **PRK**?*
Harshly. It is removed via scraping, chemical destruction, brushing, etc.

Laser

Other

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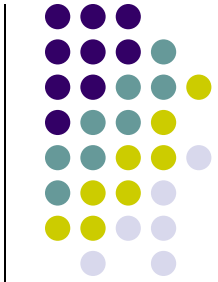

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*What is MMC?*
Mitomycin C, a chemotherapeutic agent

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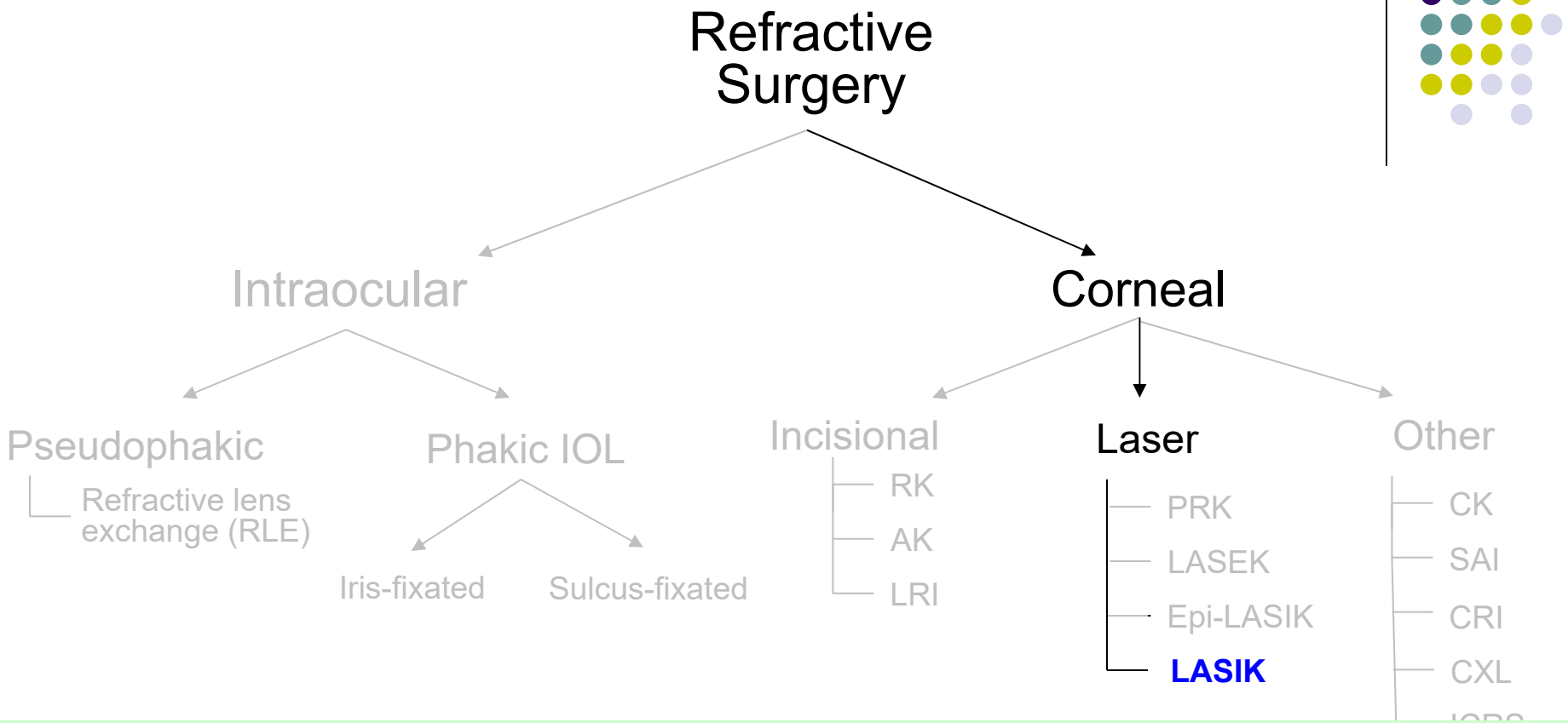


*How does LASIK deal with the epithelium?*

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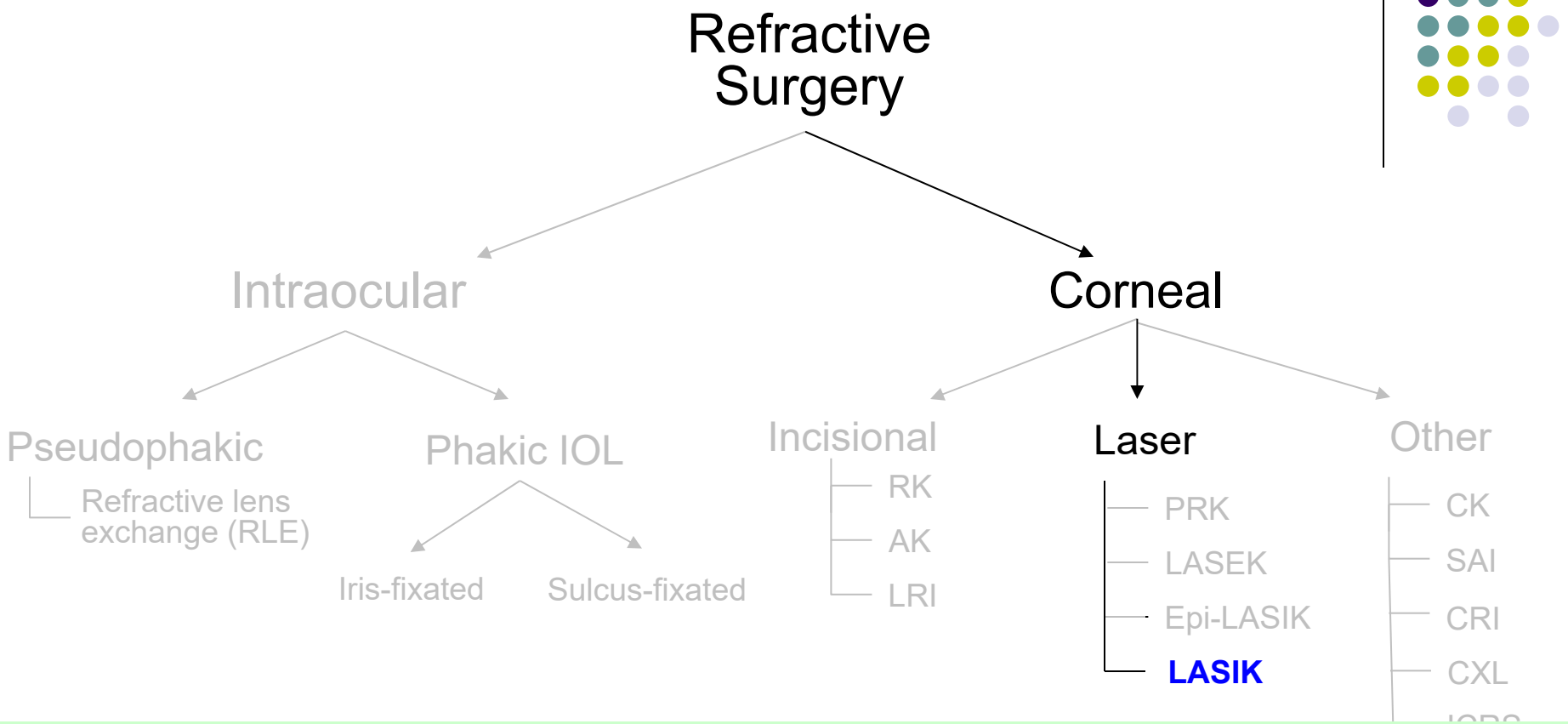
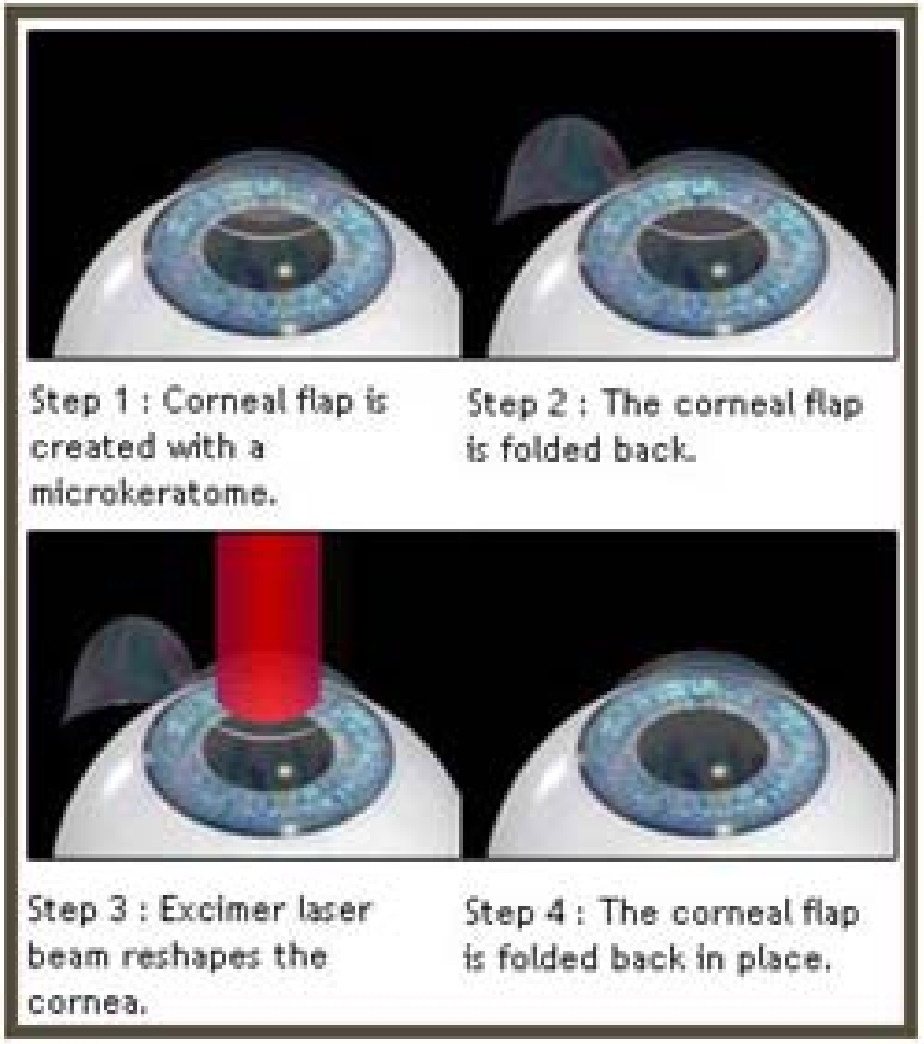


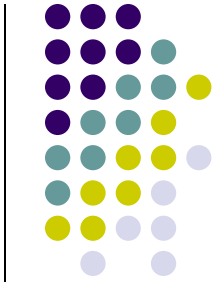

*How does LASIK deal with the epithelium?*

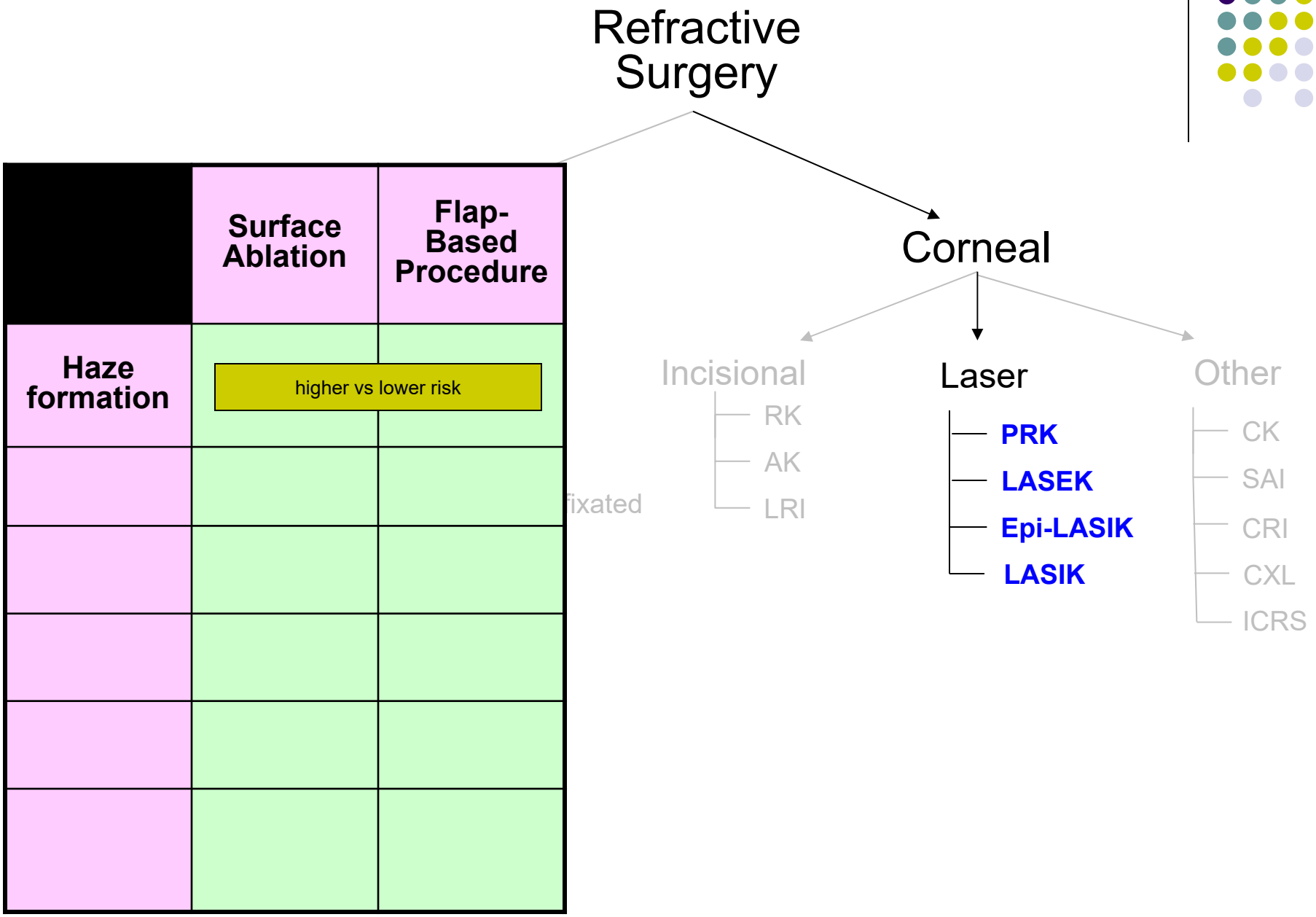
By doing an end-run around it. A hinged flap is cut in the stroma and reflected, thereby moving the epithelium out of the treatment area. The underlying stromal bed is then lased, and the flap (with its intact epithelium) is laid back in place.




LASIK: The basic steps

# Photoablative Refractive Surgery






| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| Haze formation | higher vs lower risk | |
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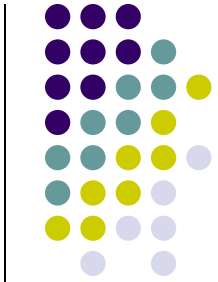
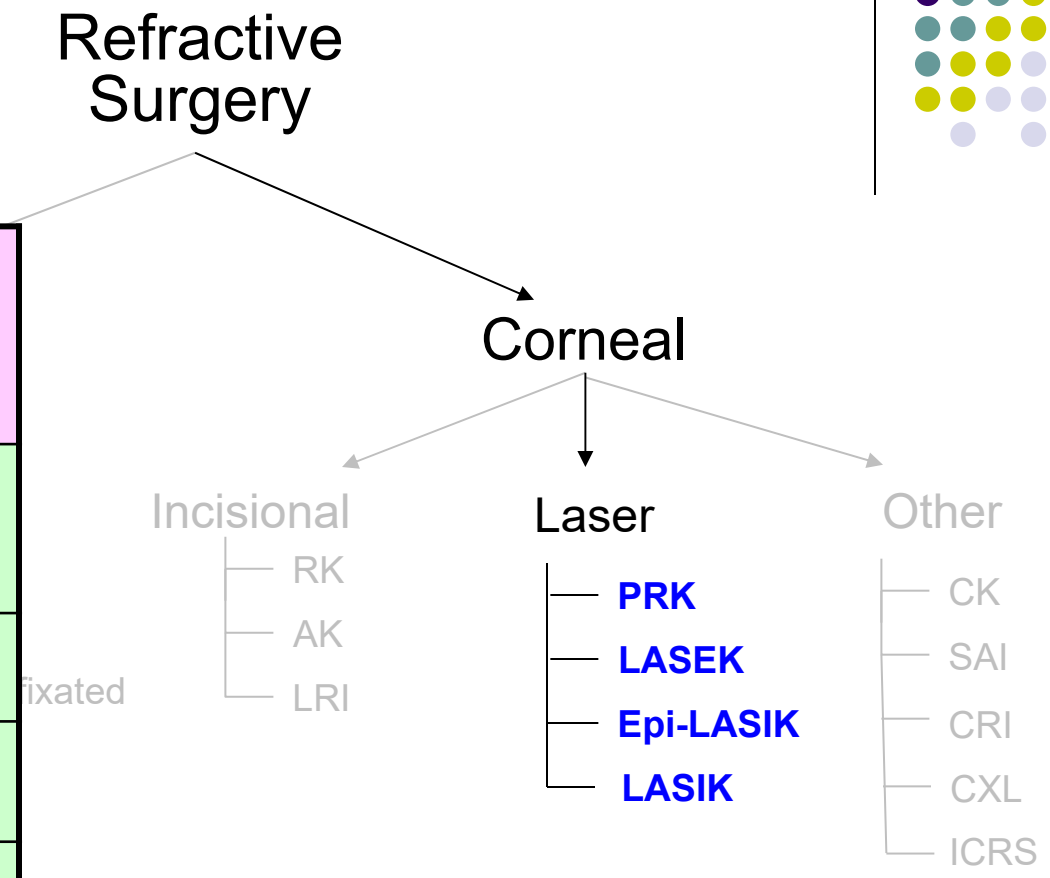
# Photoablative Refractive Surgery






| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| Haze formation | Higher risk | Lower risk |
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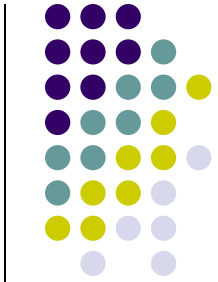
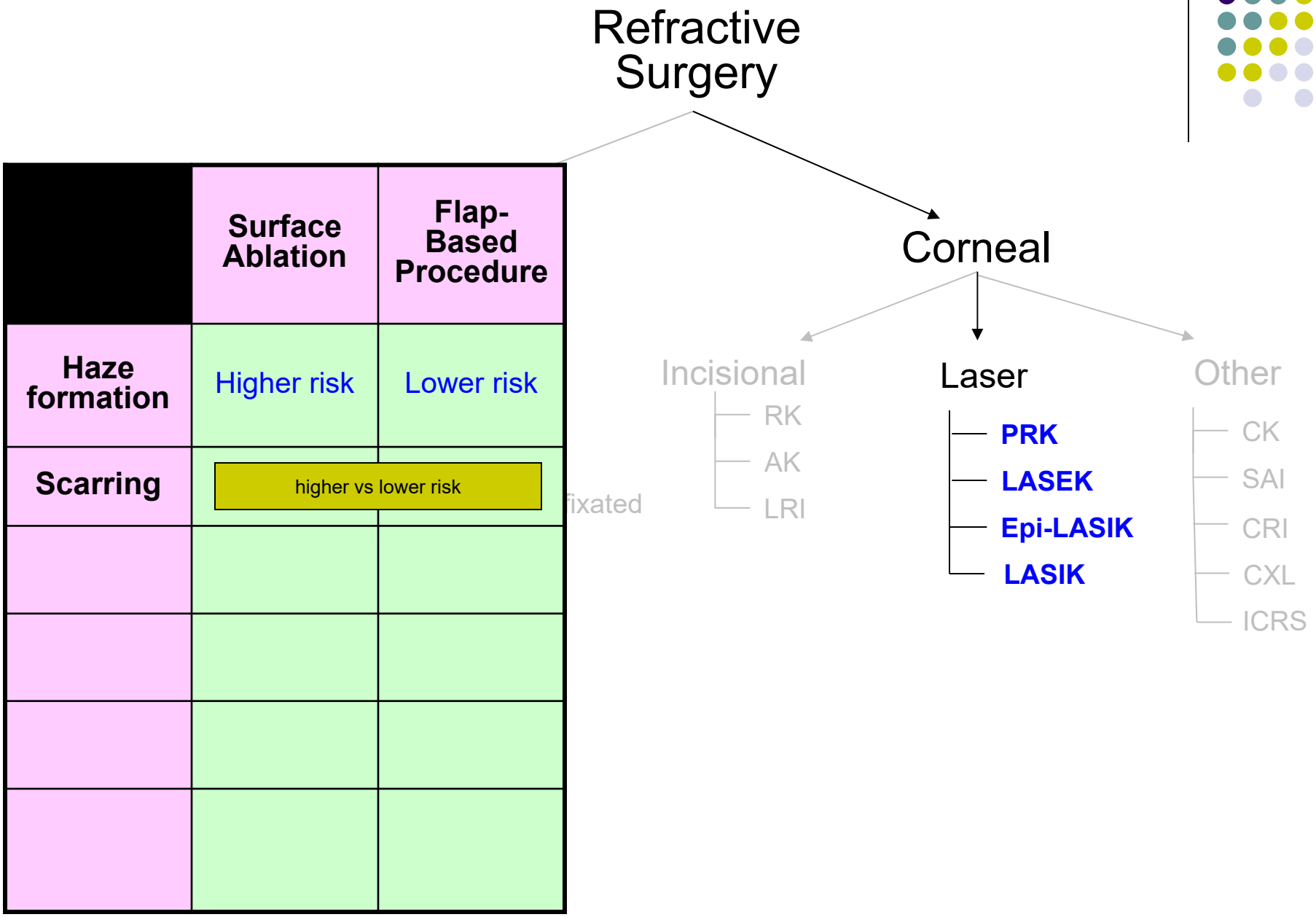
fixated

# Photoablative Refractive Surgery






| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| **Haze formation** | Higher risk | Lower risk |
| **Scarring** | higher vs lower risk | |
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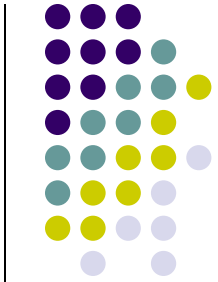
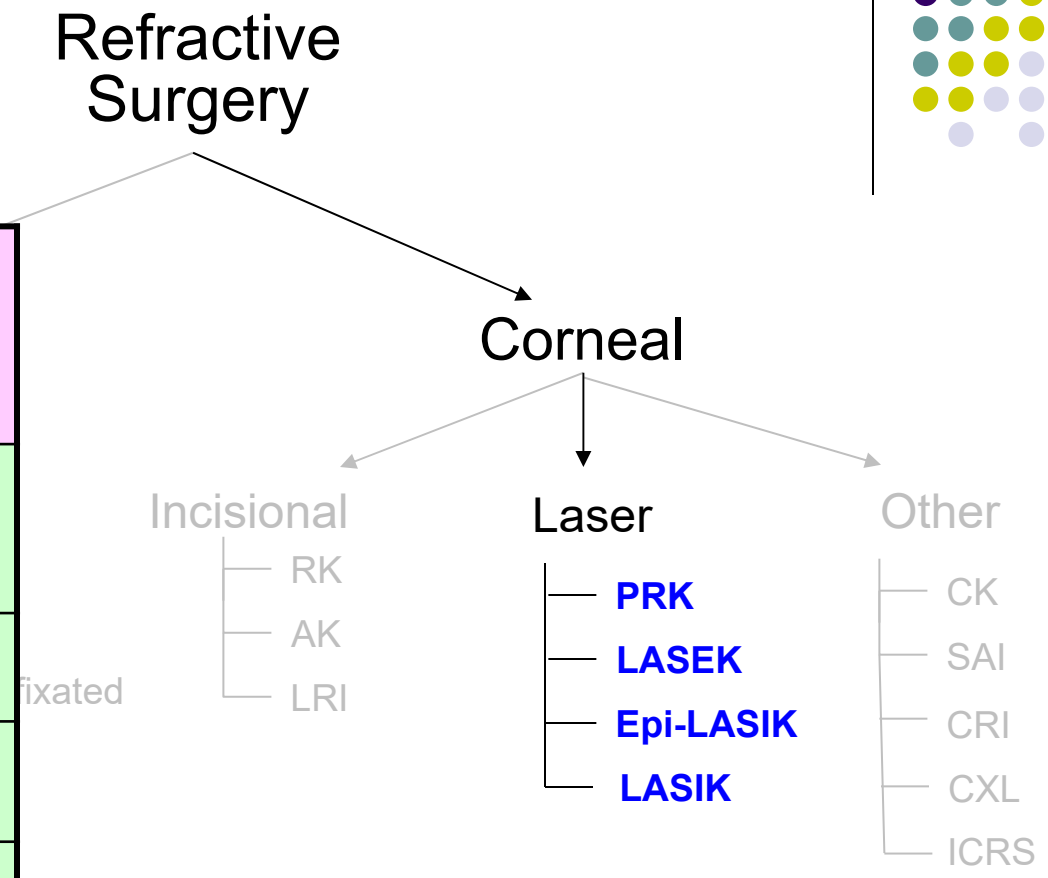
# Photoablative Refractive Surgery






| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| **Haze formation** | Higher risk | Lower risk |
| **Scarring** | **Higher risk** | **Lower risk** |
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fixated

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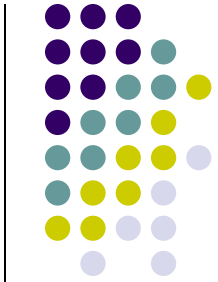

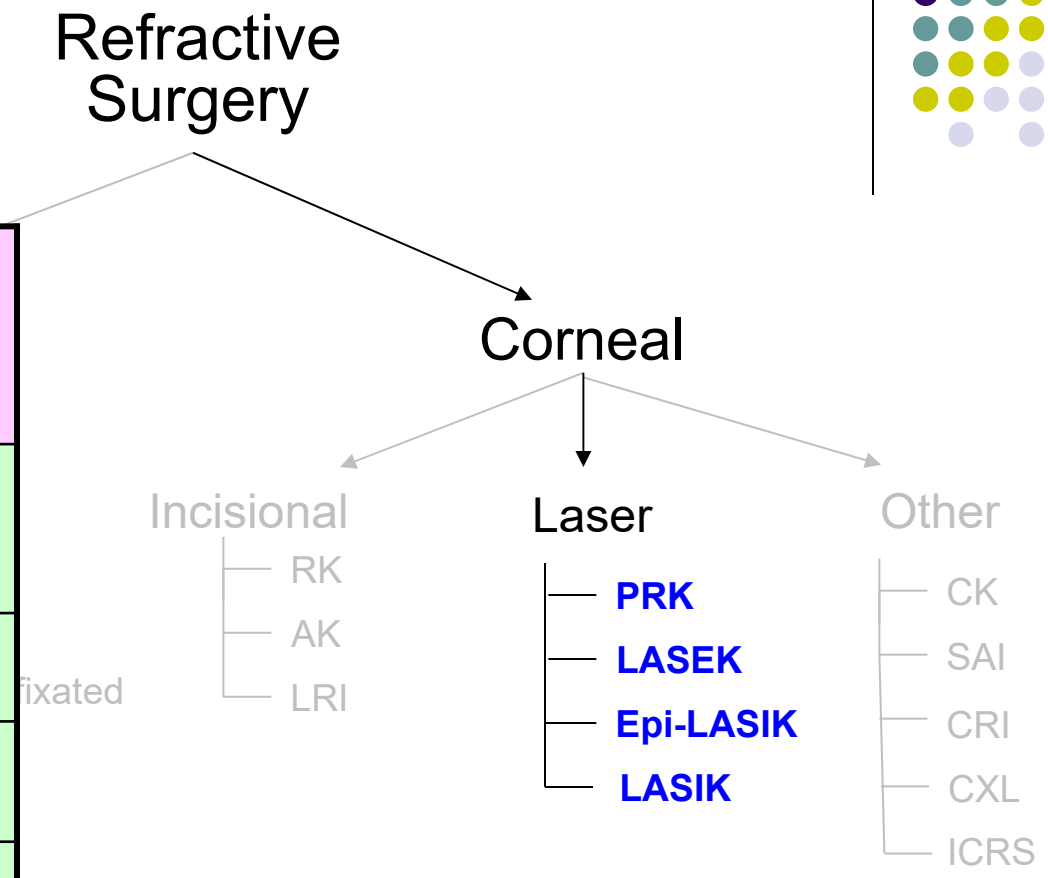


| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| **Haze formation** | Higher risk | Lower risk |
| **Scarring** | Higher risk | Lower risk |
| **Post-op pain** | worse vs better | |
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fixated

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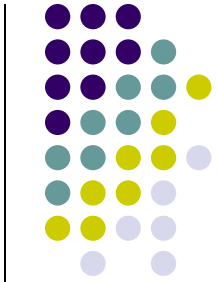

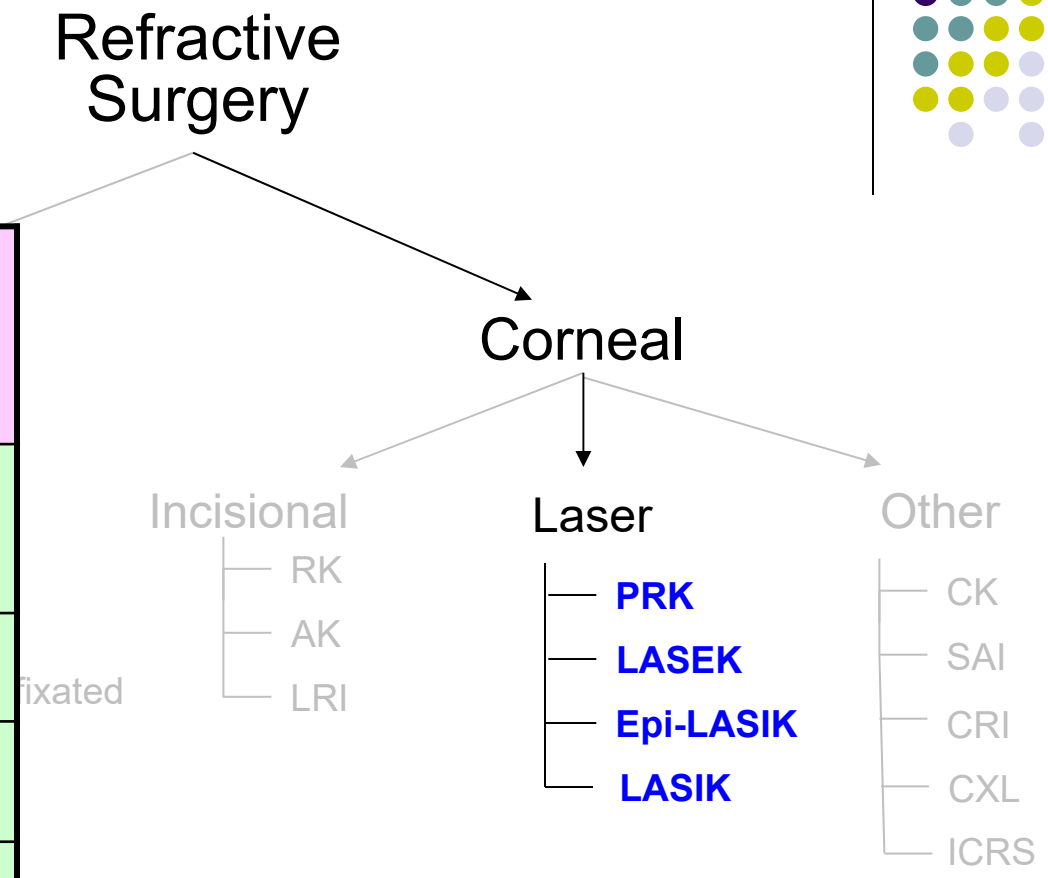


| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| **Haze formation** | Higher risk | Lower risk |
| **Scarring** | Higher risk | Lower risk |
| **Post-op pain** | **Worse** | **Better** |
| | | |
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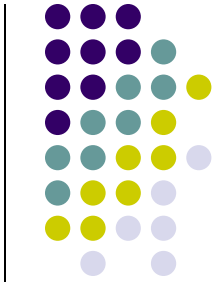

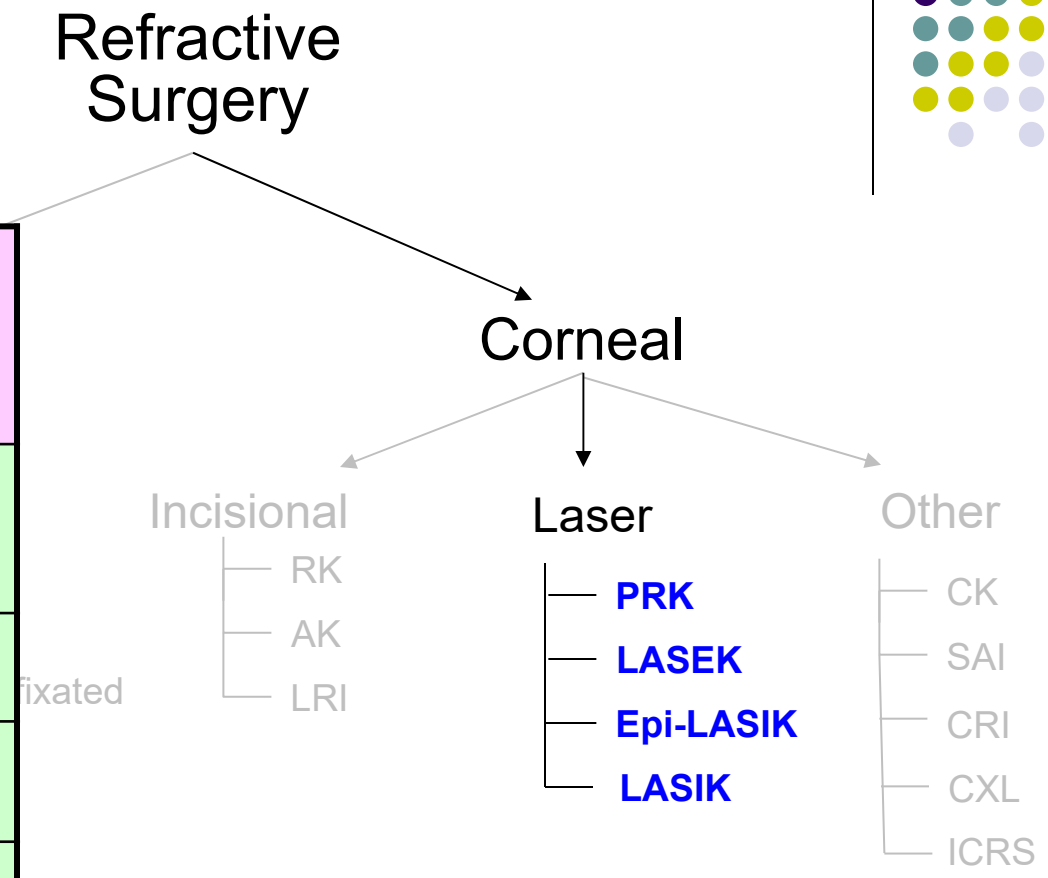


| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| **Haze formation** | Higher risk | Lower risk |
| **Scarring** | Higher risk | Lower risk |
| **Post-op pain** | Worse | Better |
| **Recovery time** | slower vs faster | |
| | | |
| | | |

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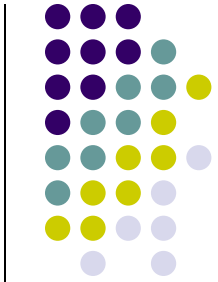

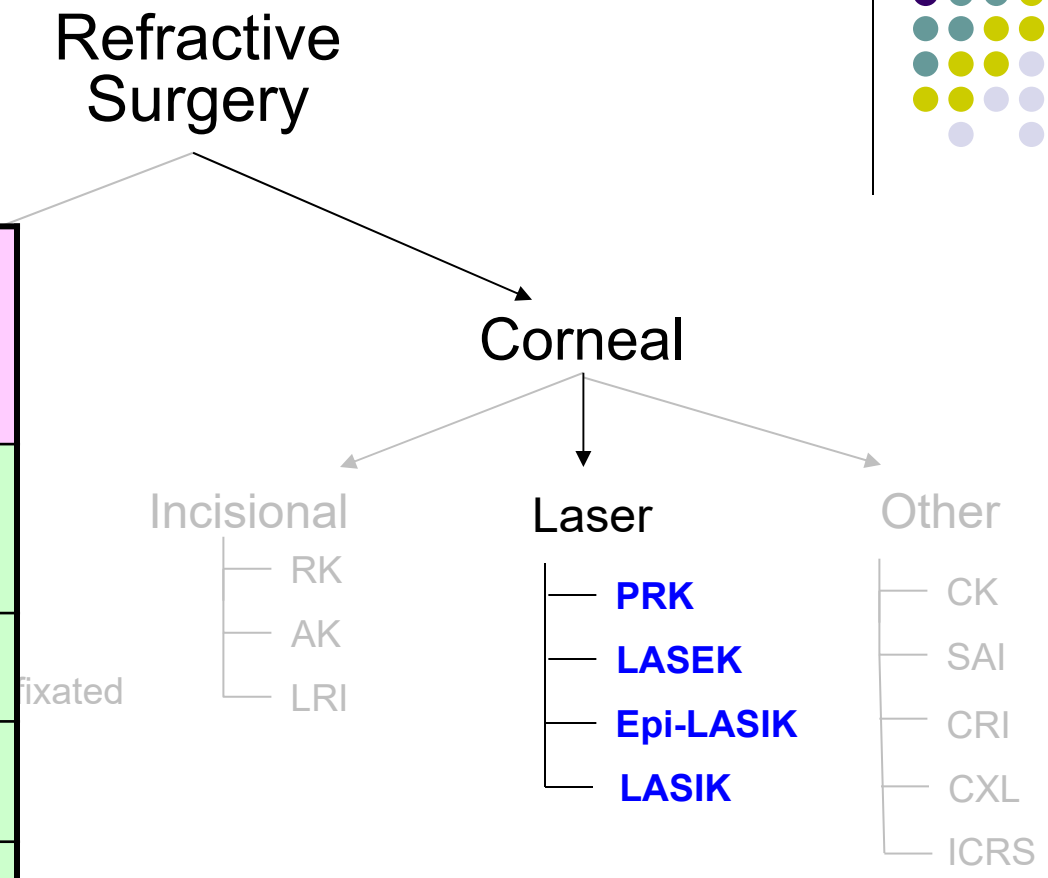


| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| **Haze formation** | Higher risk | Lower risk |
| **Scarring** | Higher risk | Lower risk |
| **Post-op pain** | Worse | Better |
| **Recovery time** | **Slower** | **Faster** |
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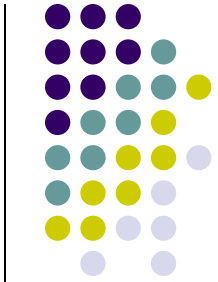

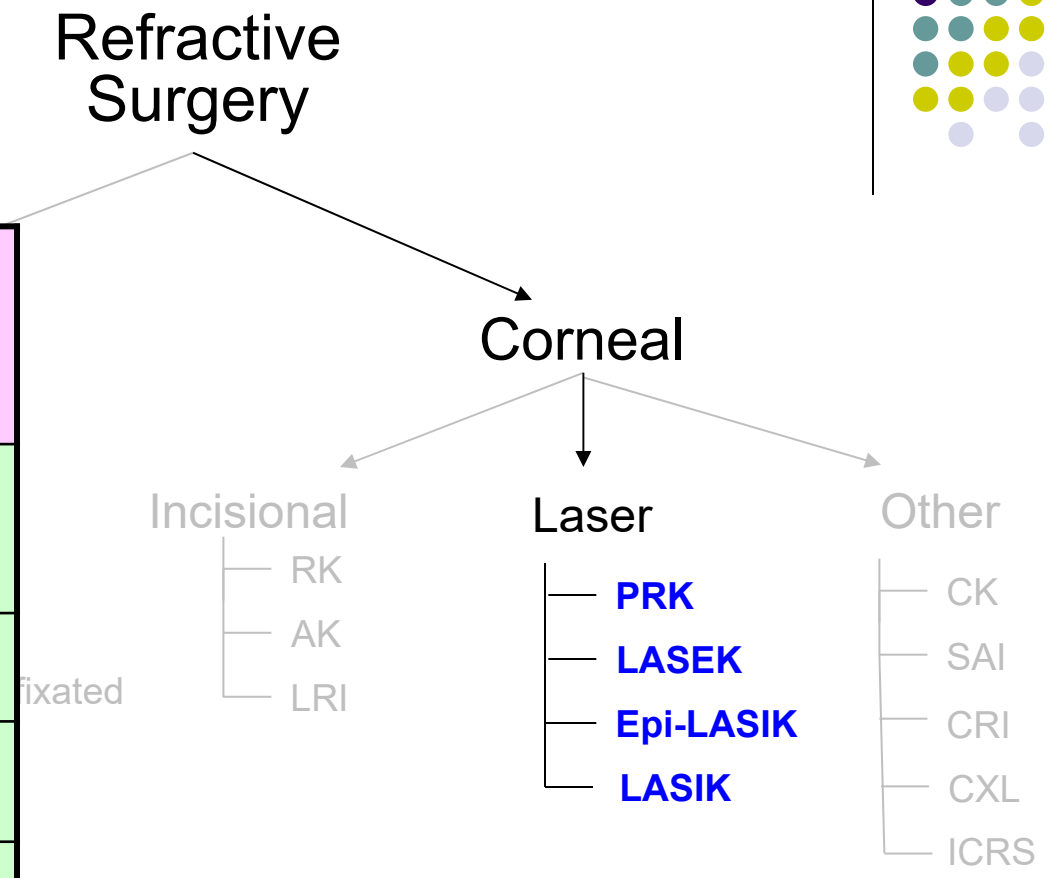


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| **Post-op pain** | Worse | Better |
| **Recovery time** | Slower | Faster |
| **Ectasia risk** | higher vs lower risk | |
| | | |

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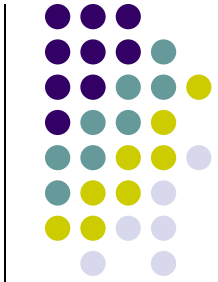

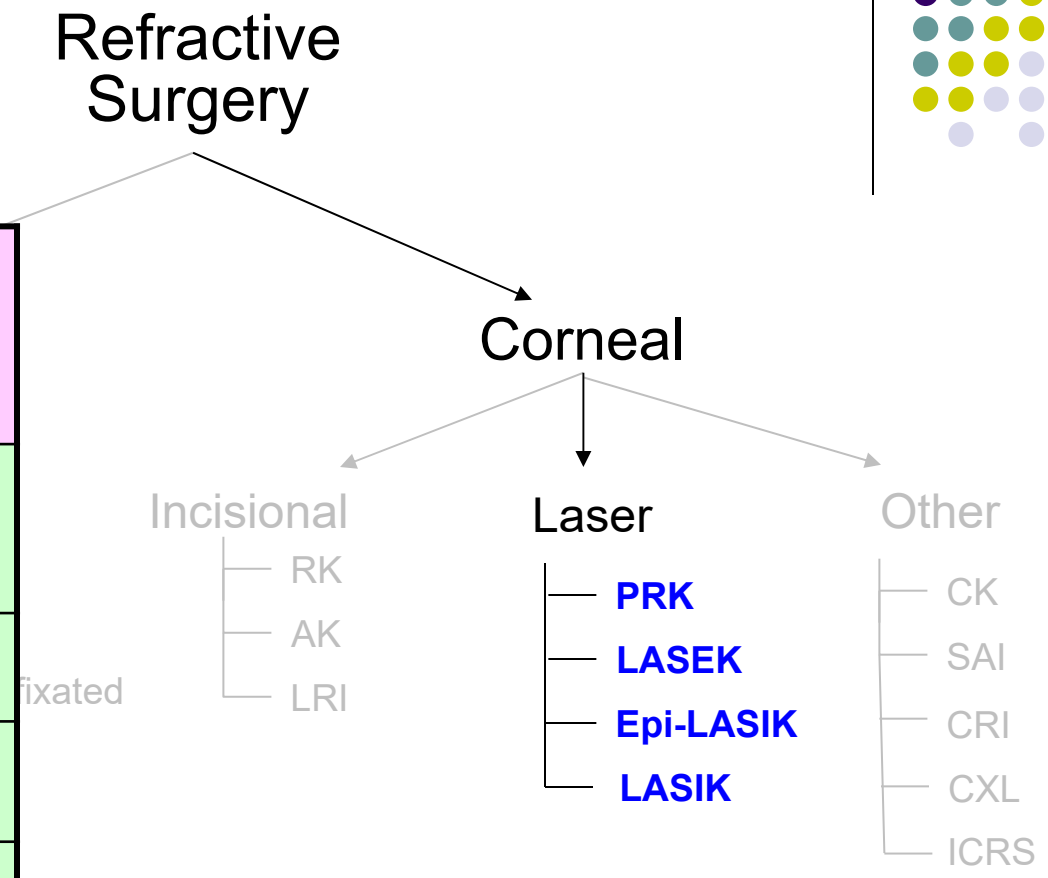


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|---|---|---|
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| **Scarring** | Higher risk | Lower risk |
| **Post-op pain** | Worse | Better |
| **Recovery time** | Slower | Faster |
| **Ectasia risk** | **Lower** | **Higher** |
| | | |

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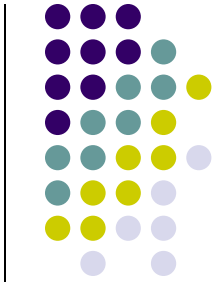

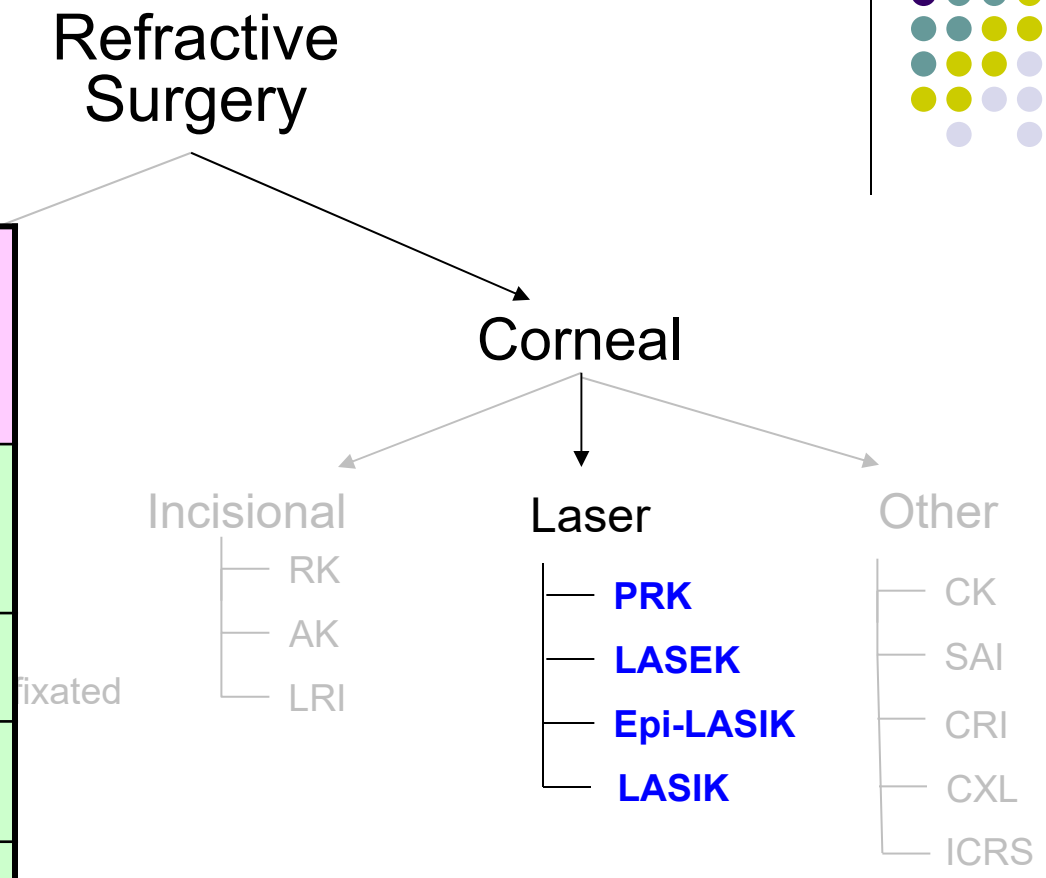


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| **Scarring** | Higher risk | Lower risk |
| **Post-op pain** | Worse | Better |
| **Recovery time** | Slower | Faster |
| **Ectasia risk** | Lower | Higher |
| **Post-op infection risk** | higher vs lower risk | |

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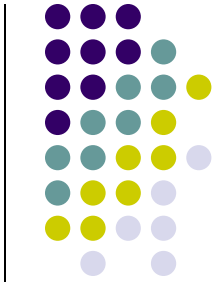

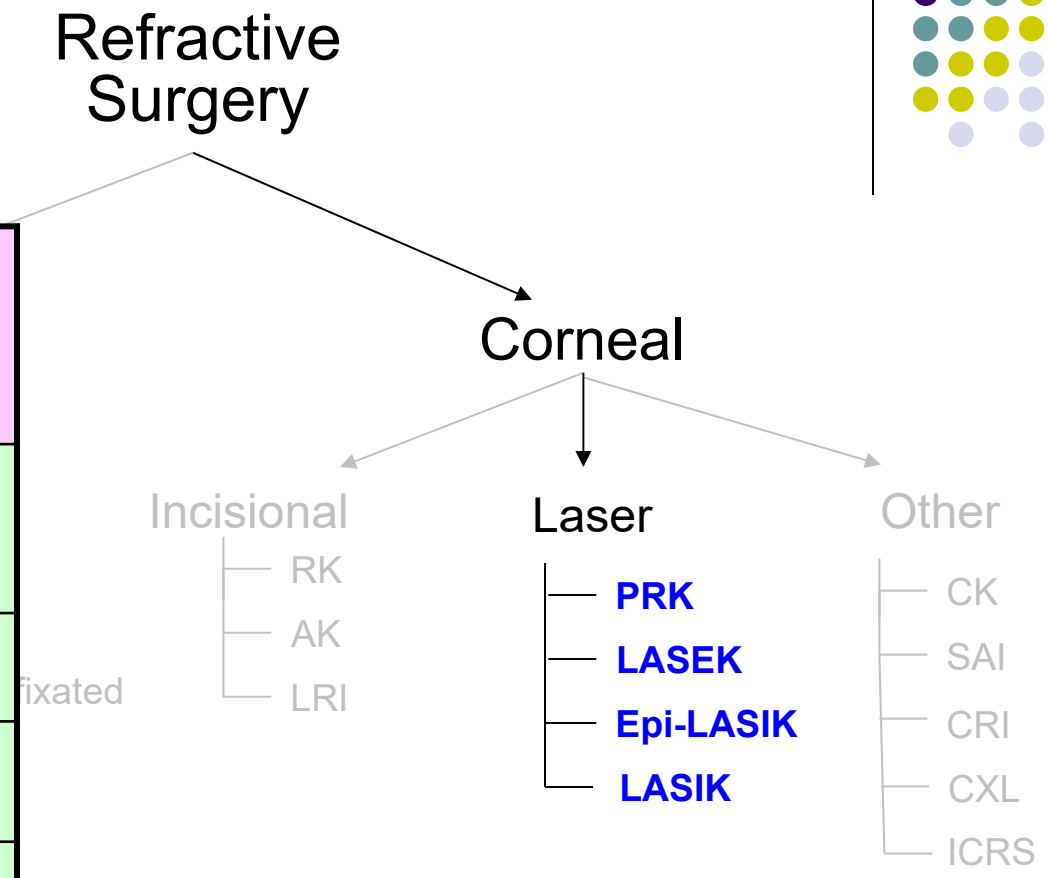


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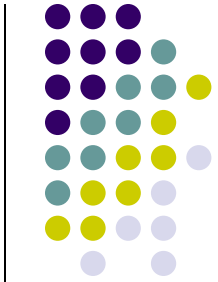
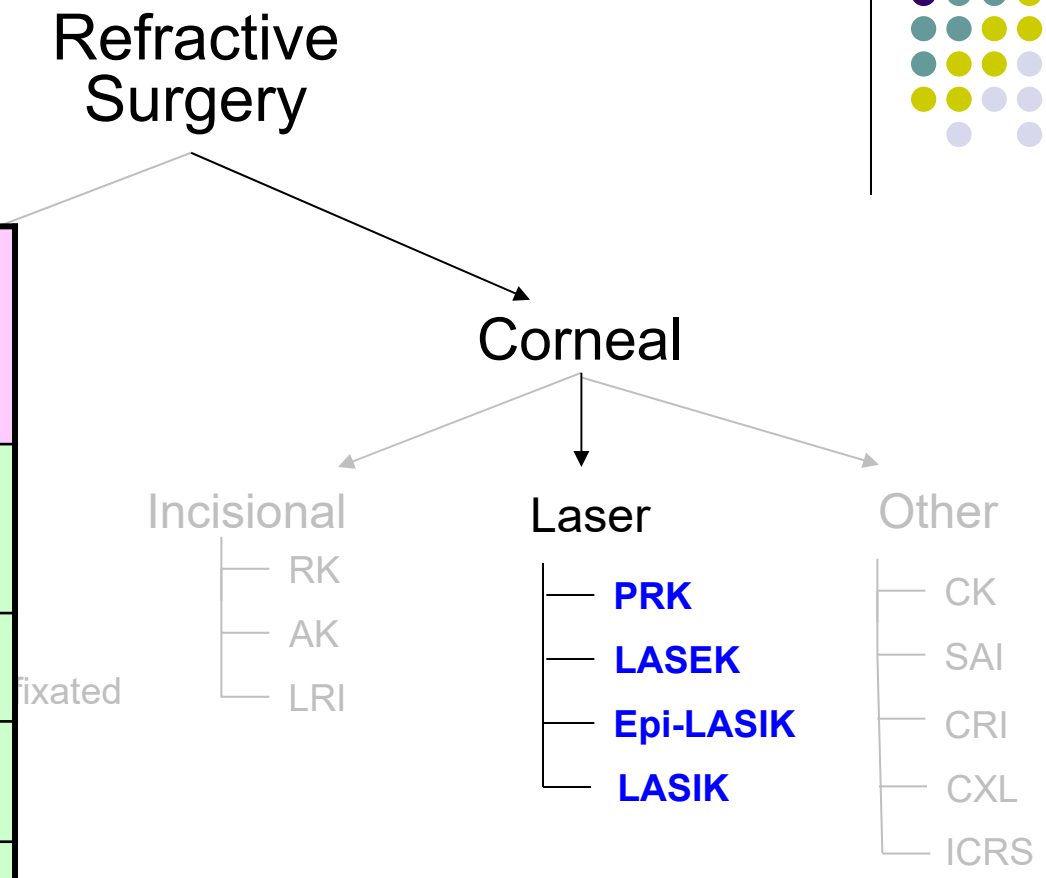
| **Ectasia risk** | Lower | Higher |
| **Post-op infection risk** | **Same** | **Same** |

# Photoablative Refractive Surgery






| | Surface Ablation | Flap-Based Procedure |
|---|---|---|
| Haze formation | Higher risk | Lower risk |
| Scarring | Higher risk | Lower risk |
| Post-op pain | Worse | Better |
| Recovery time | Slower | Faster |
| Ectasia risk | Lower | Higher |
| **Post-op infection risk** | **Same** | **Same** |

*This assertion is a bit misleading, because while post-op infection rates are about the same, infections after surface ablation are actually easier to treat because:*

1)

2)

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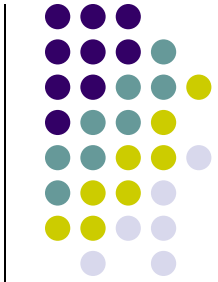

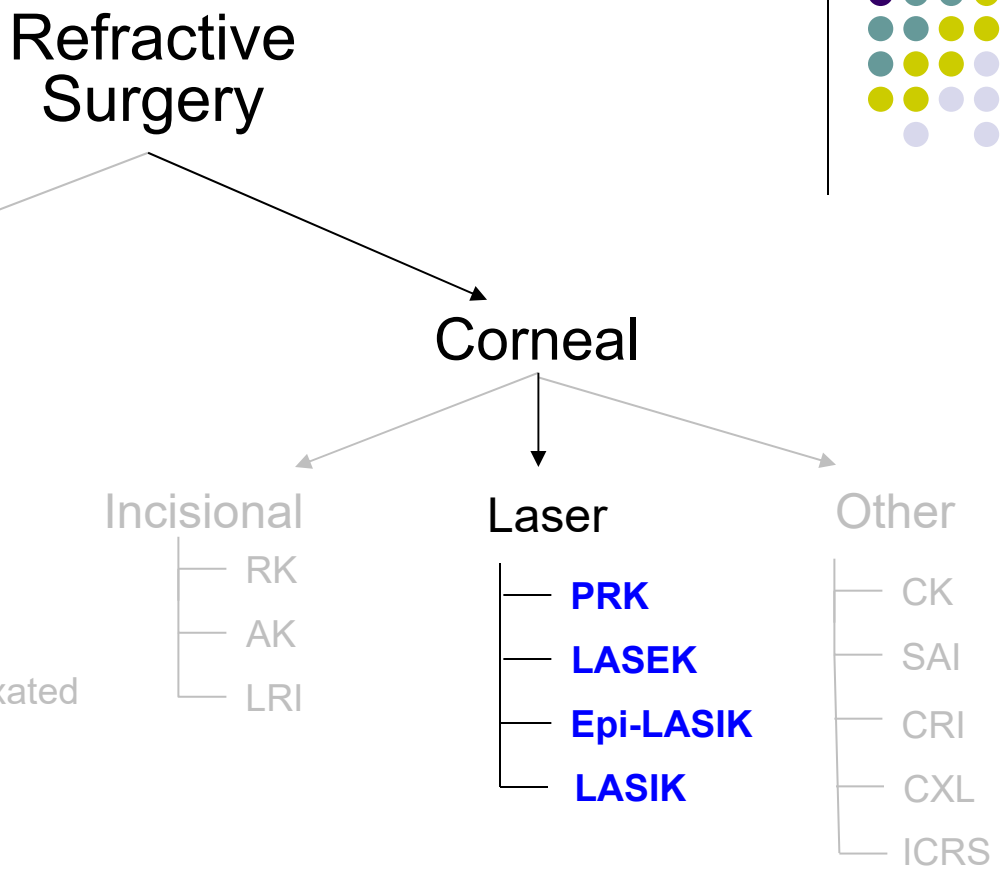


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*This assertion is a bit misleading, because while post-op infection rates are about the same, infections after surface ablation are actually easier to treat because:*
1) they are on the surface and thus more directly vulnerable to antibiotic drops; *and*
2) the bug is usually a common Gram(+) variety, whereas sub-flap bugs are more likely to be unusual/atypical

# Photoablative Refractive Surgery

Refractive

*There are certain clinical scenarios in which surface ablation procedures are preferred over LASIK, or at least have certain advantages. For example:*
*--Pt age:* If the pt is relatively young v old, surface ablation is preferred

Intraocul

Pseudophakic

Refractive lens exchange (RLE)

Iris-fixated

Sulcus-fixated

RK

AK

LRI

**PRK**

**LASEK**

**Epi-LASIK**

LASIK

CK

SAI

CRI

CXL

ICRS

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*There are certain clinical scenarios in which surface ablation procedures are preferred over LASIK, or at least have certain advantages. For example:*
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*Does 'relatively young' mean less than 18 years of age?*

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*Does 'relatively young' mean less than 18 years of age?*
No, because individuals younger than 18 should **not** undergo keratorefractive surgery (in fact, many surgeon will decline to operate on individuals younger than 21)

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*Why is a thin residual stromal bed* (RSB) *undesirable?*
Because it increases the likelihood that the cornea could suffer
three words

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Pseudophakic
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*Why is a thin residual stromal bed* (RSB) *undesirable?*
Because it increases the likelihood that the cornea could suffer post-surgical ectasia

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Because it increases the likelihood that the cornea could suffer post-surgical ectasia

*What is the minimum RSB value most surgeons will accept?*

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*What is the minimum RSB value most surgeons will accept?*
250 μm

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*Why is a thin cornea less-than-ideal for LASIK?*

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*Why is a thin cornea less-than-ideal for LASIK?*
Because all else being equal, the chance of ending up with a thin RSB is greater

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*How steep is 'too steep'?*

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Pseudophakic

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About 48D

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*How steep is 'too steep'?*
About 48D

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*Why are too-steep and/or too-flat corneas not good candidates for LASIK?*

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Because the extreme corneal curvature increases the likelihood of a complication occurring during flap creation

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About 48D

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K
RS
XL

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Intraocul

Pseudophakic

*What is a…*
*…buttonhole flap?* One with a central perforation

*How steep is 'too ste*
About 48D

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LASIK flap: Buttonhole

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Pseudophakic

*What is a…*
*…buttonhole flap?* One with a central perforation
*---free cap?* One unattached to the K (ie, the hinge is cut)

*How steep is 'too ste*
About 48D

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About 40D

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LASIK flap: Free cap

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*If a pt with a too-steep or too-flat cornea insists on LASIK, what surgical adjustment can be made that will greatly reduce the likelihood of a flap complication?*

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Create the flap with a femtosecond laser rather than a mechanical keratome

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--Unusual t

*In this context, what does EBMD stand for?*

Intraocul

Pseudophakic
- Refractive lens exchange (RLE)

Iris-fixated

Sul

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*What general class of disease is it?*

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*Certain corneal issues argue in favor of PRK rather than LASIK. What are they?*
--Anticipate
--Thin corne
--Unusually
**--EBMD**
--Unusual t

*In this context, what does EBMD stand for?*
Epithelial basement membrane disease

*What general class of disease is it?*
A corneal dystrophy

Intraocul

Pseudophakic
- Refractive lens exchange (RLE)

Iris-fixated

Sul

LASIK

- CK
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- CRI
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# Photoablative Refractive Surgery

Refractive

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--Cogan's microcystic dystrophy
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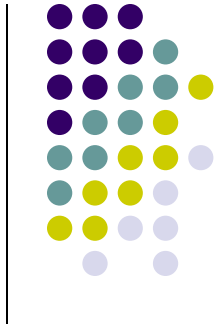
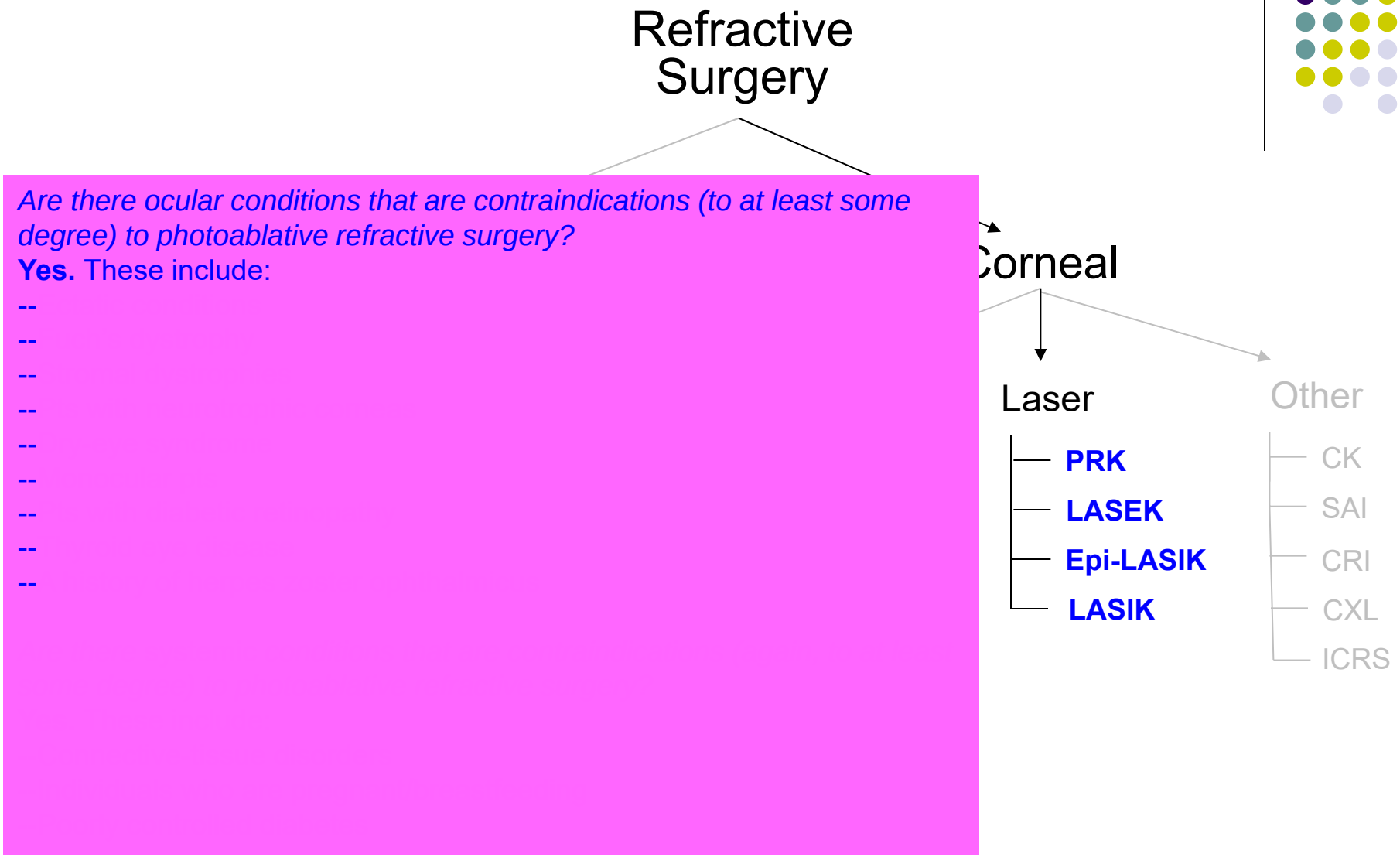
# Photoablative Refractive Surgery






*Are there ocular conditions that are contraindications (to at least some degree) to photoablative refractive surgery?*

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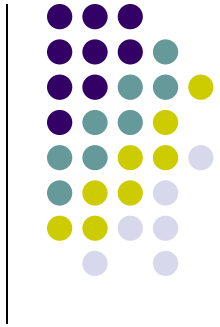

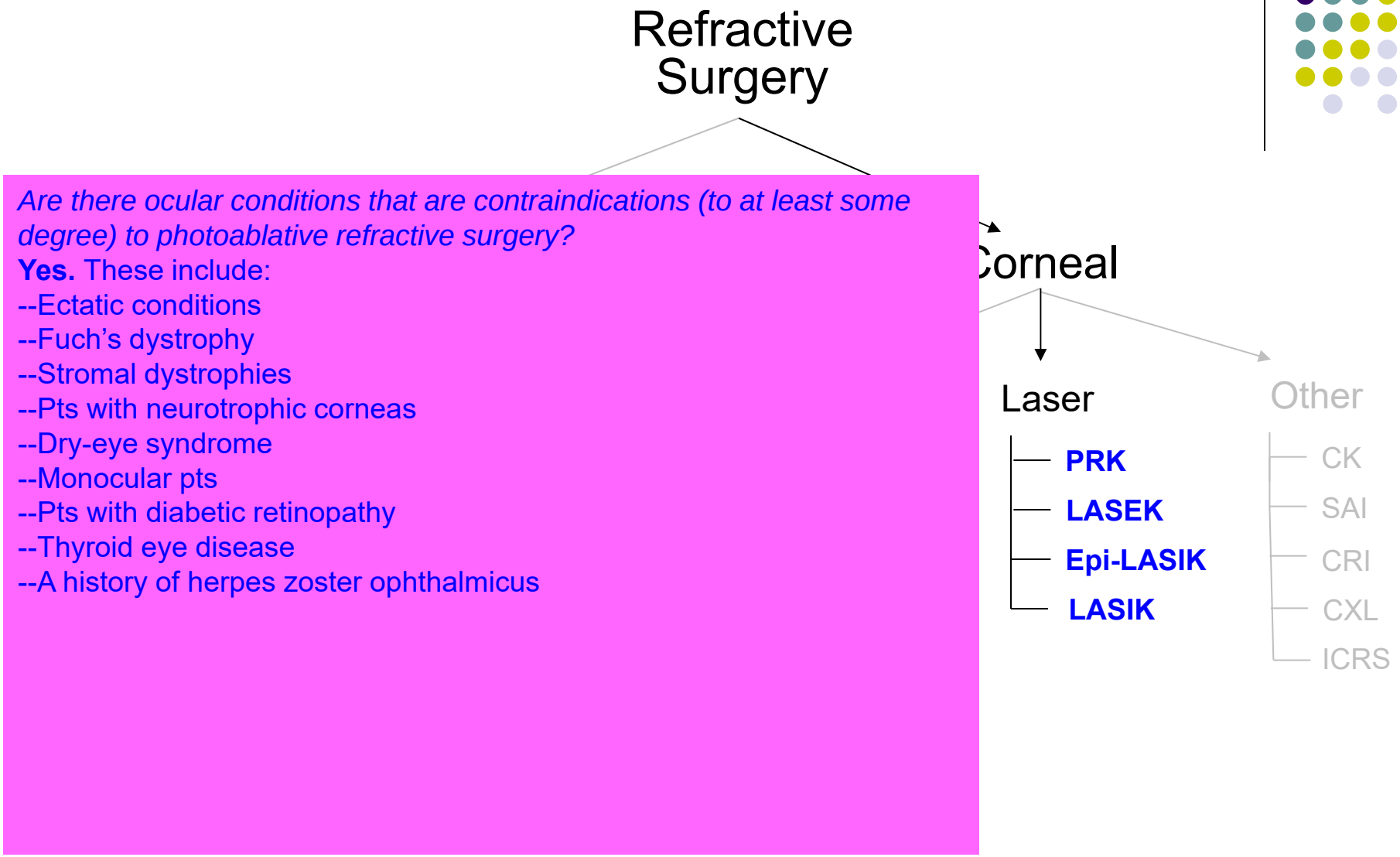


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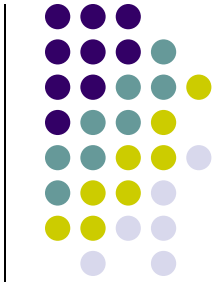
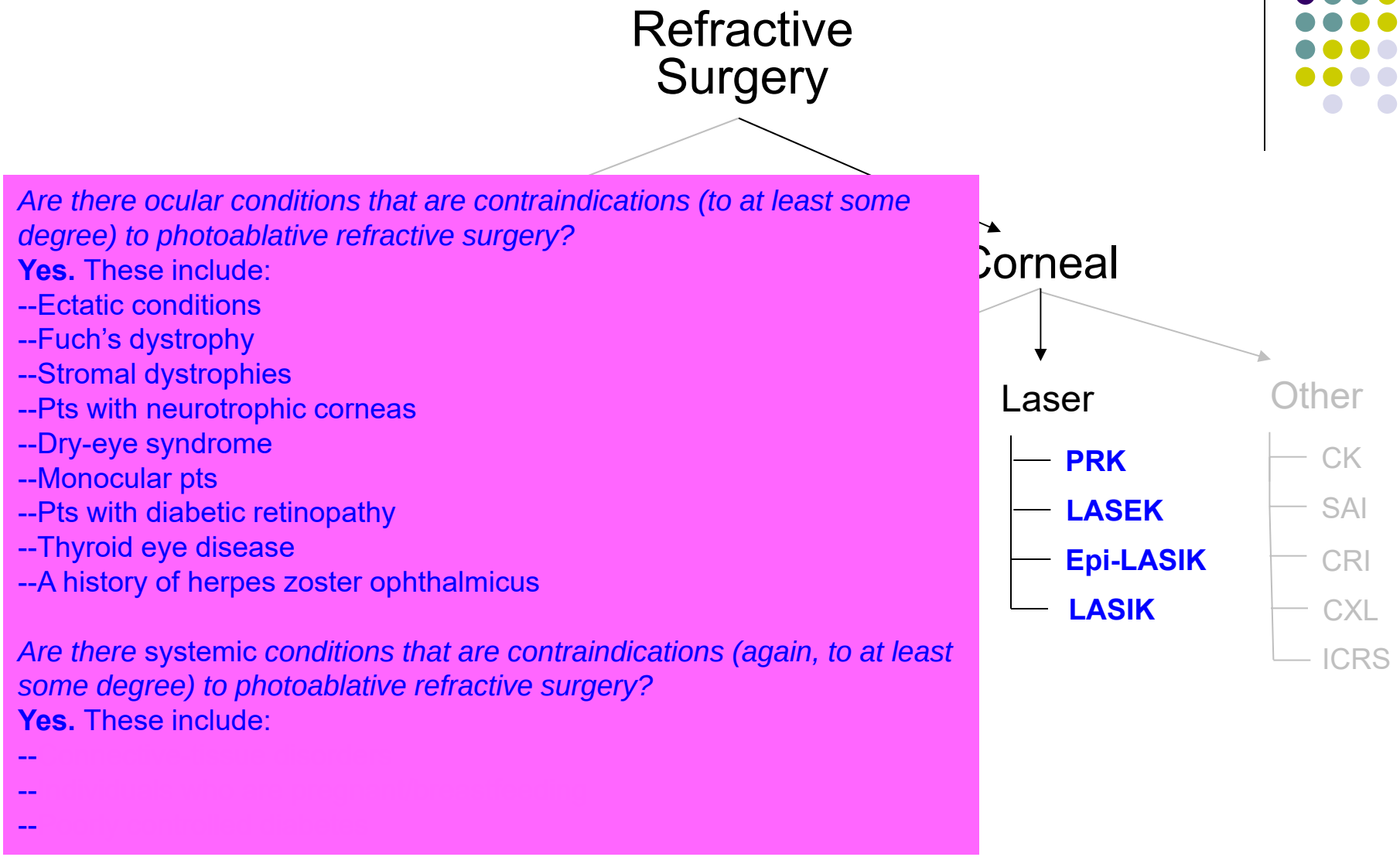
# Photoablative Refractive Surgery



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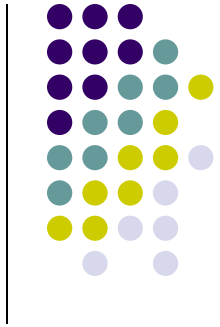

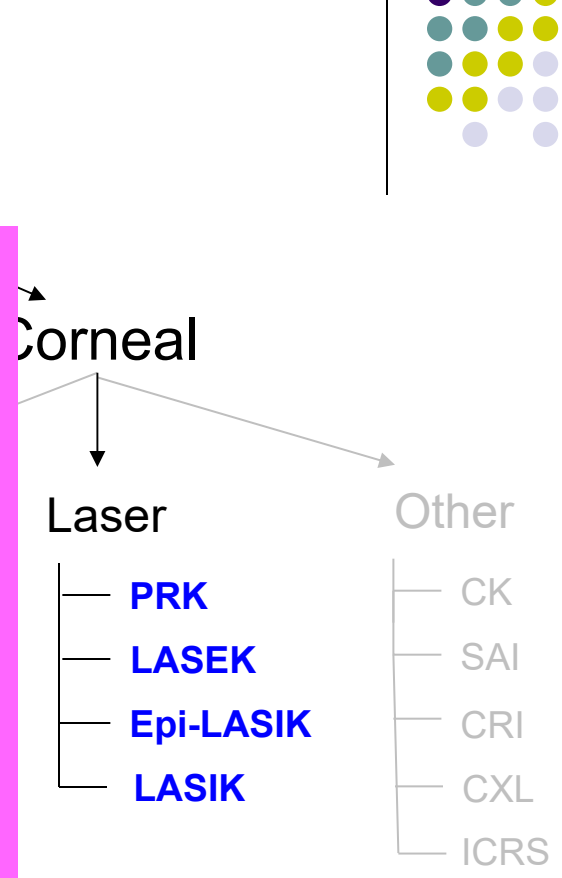


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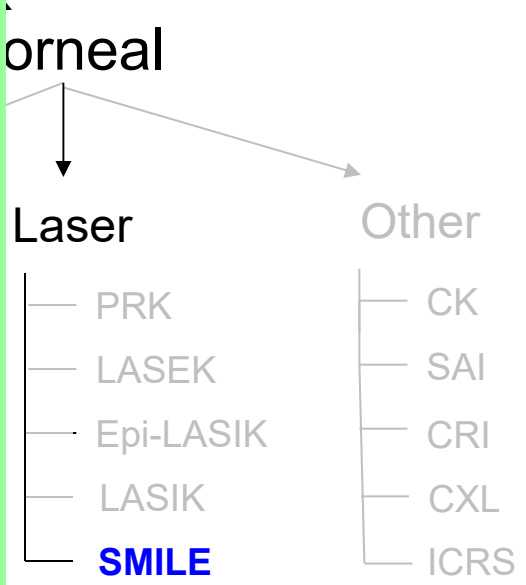
--Connective-tissue disorders
--Individuals who are pregnant/breastfeeding
--Poorly controlled diabetes

# Photoablative Refractive Surgery

Lenticule Extraction

Refractive

*By way of a reminder: In broad terms, how is the SMILE technique of refractive lenticule extraction (ReLEx) performed?*



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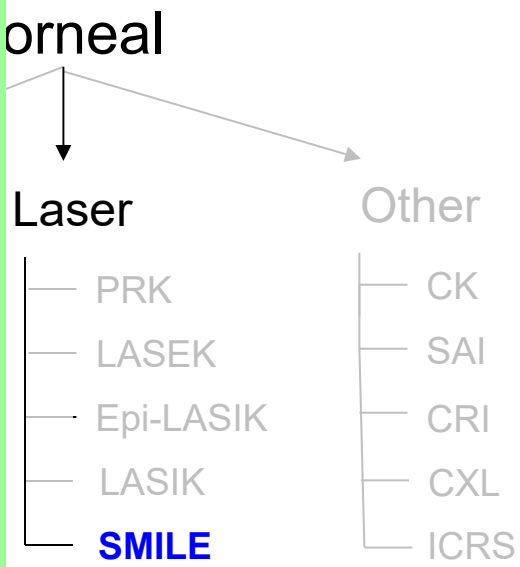
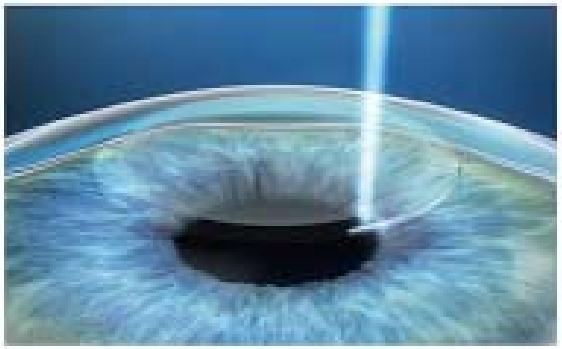
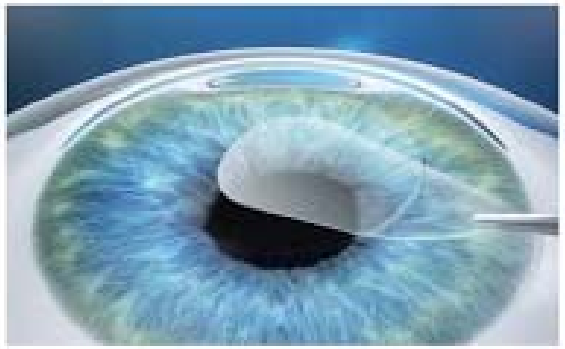
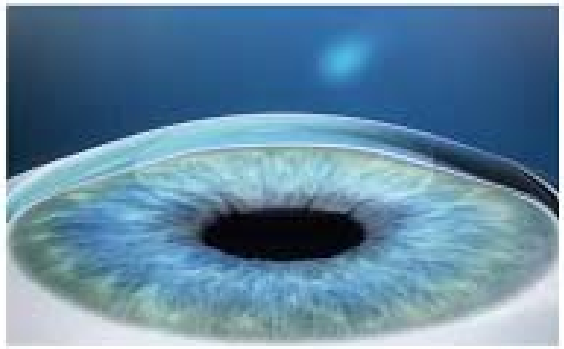




*Creation of lenticule and small access (< 4 mm)*



*Removal of the lenticule*



*Refractive error is corrected*

SMILE

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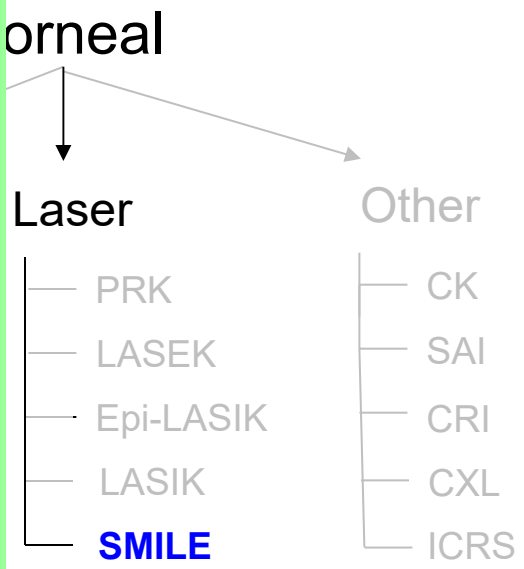

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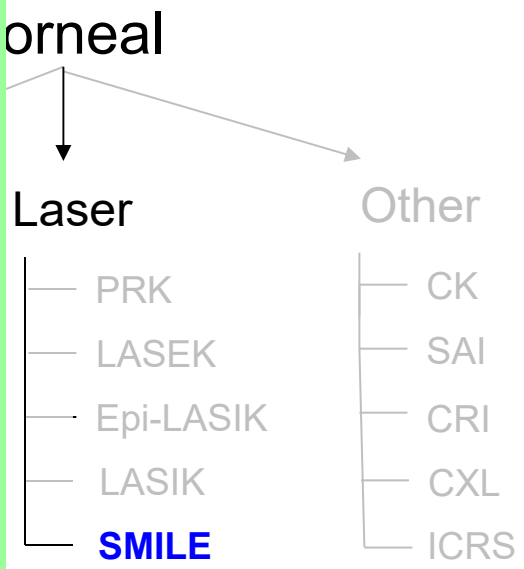

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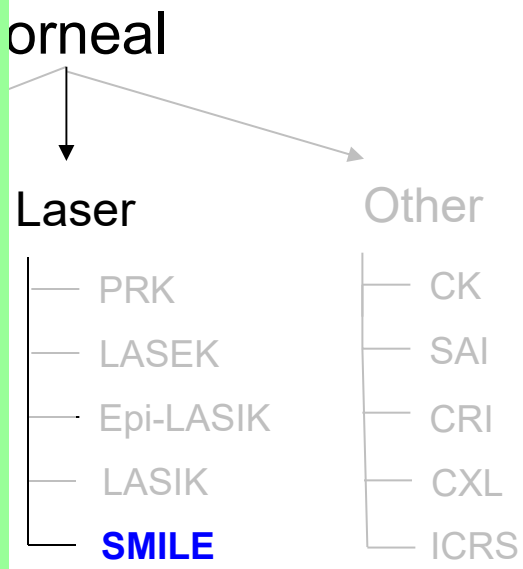

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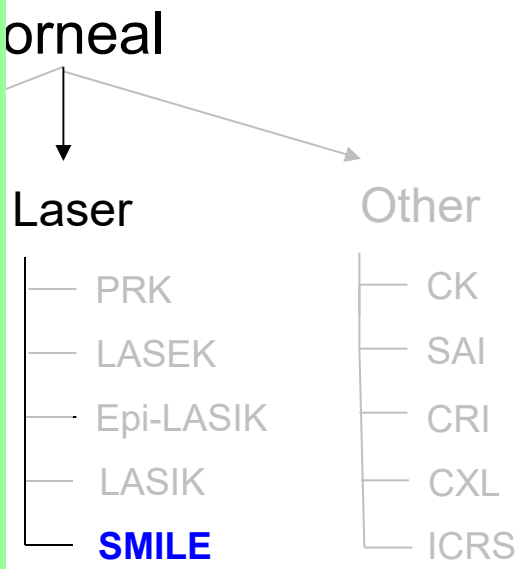

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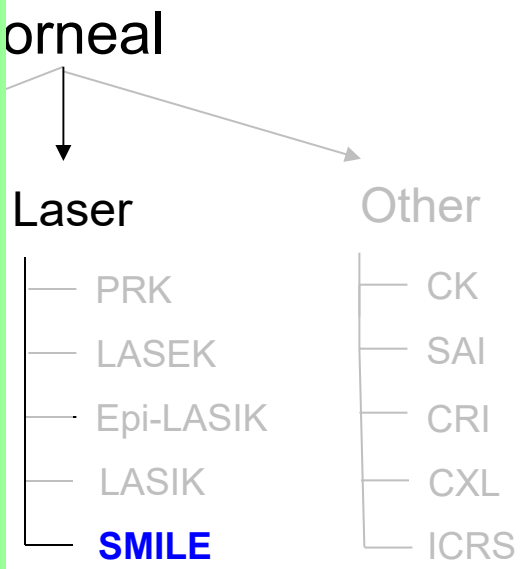

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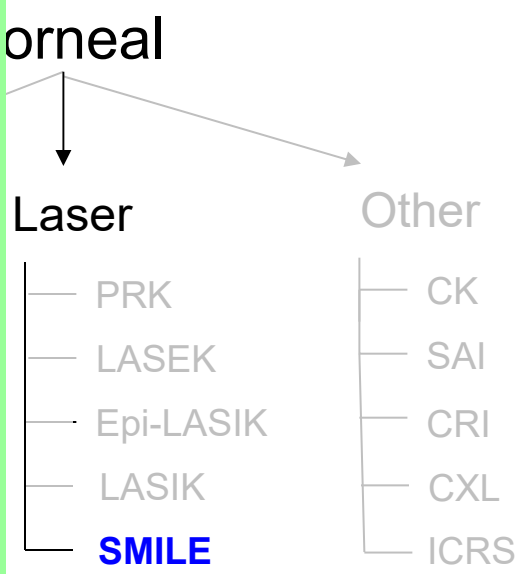

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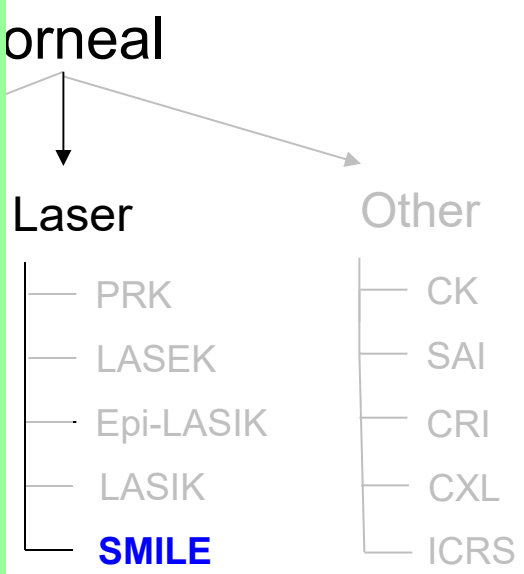

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