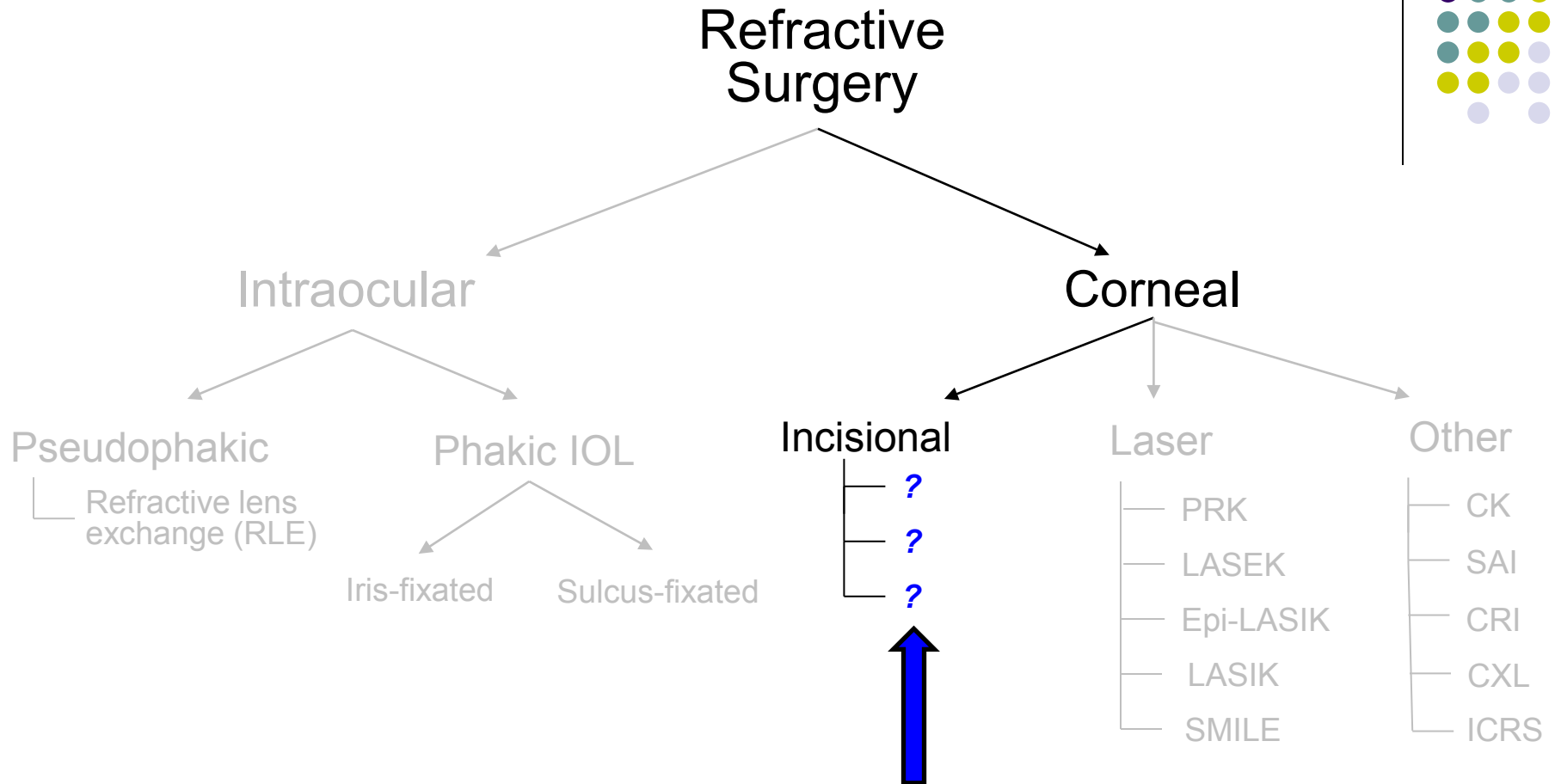
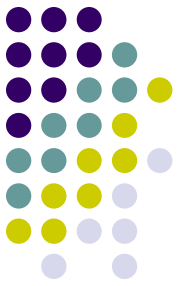
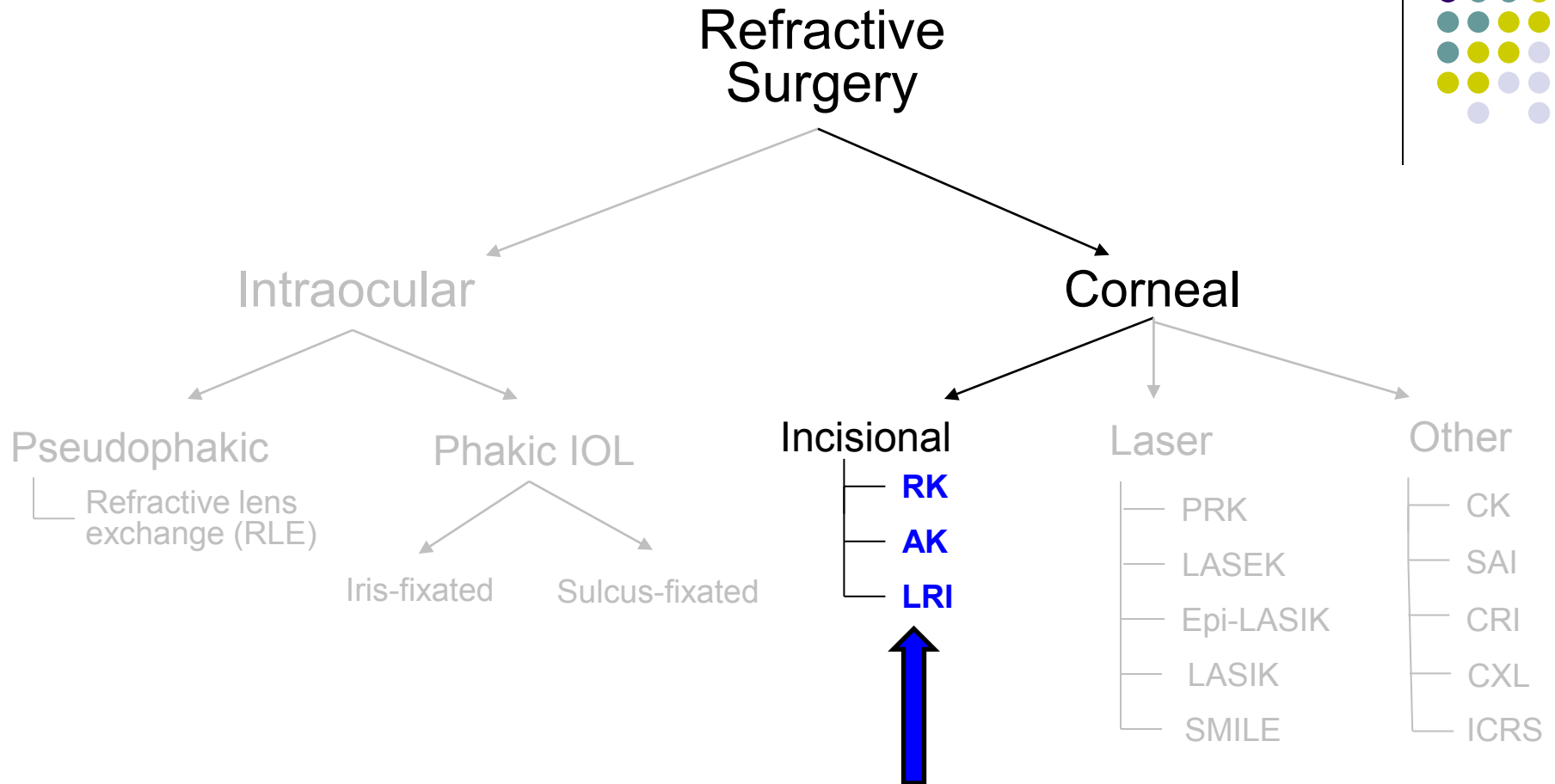


Incisional Corneal Refractive Surgery



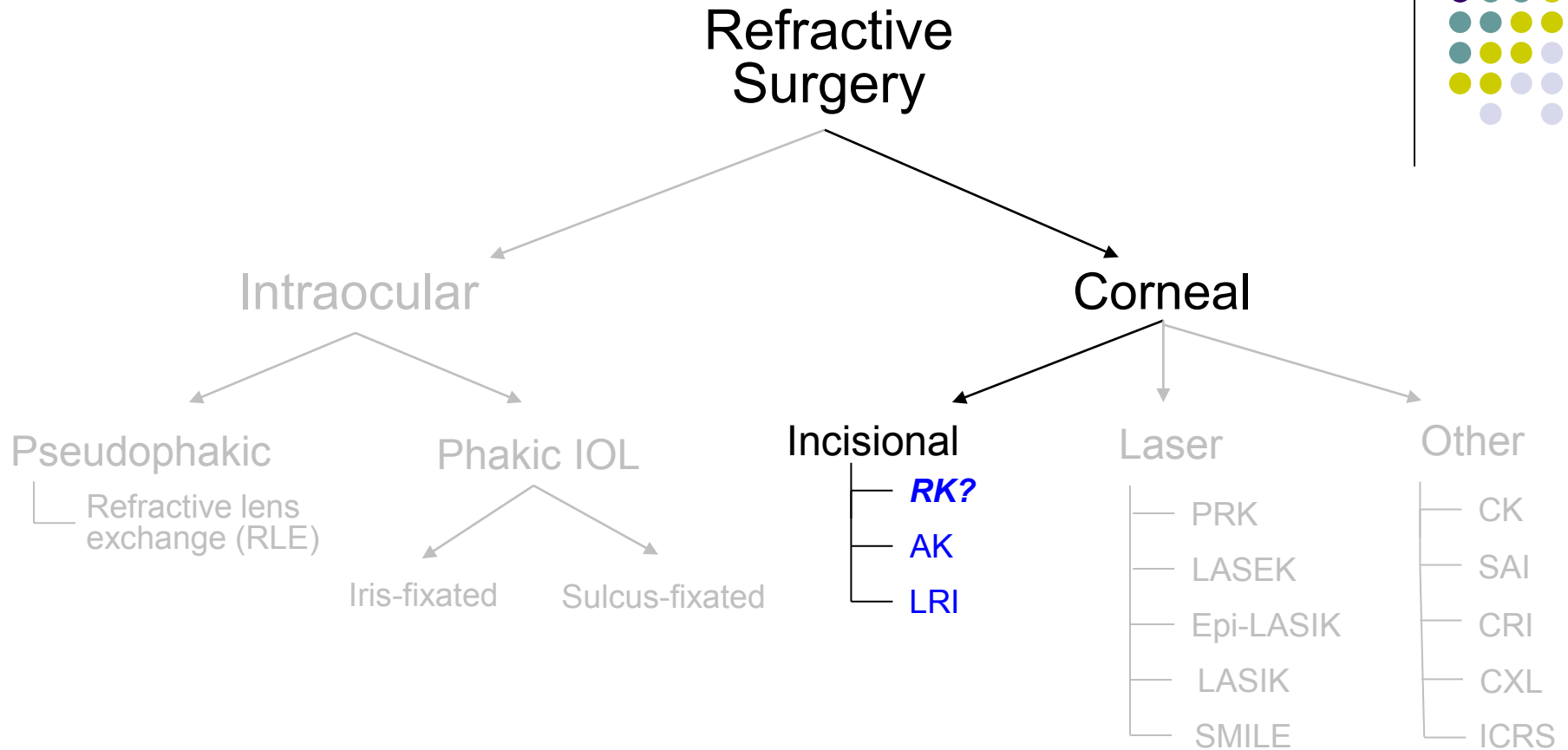
What are the three incisional procedures covered in the Refractive Surgery book?

Incisional Corneal Refractive Surgery



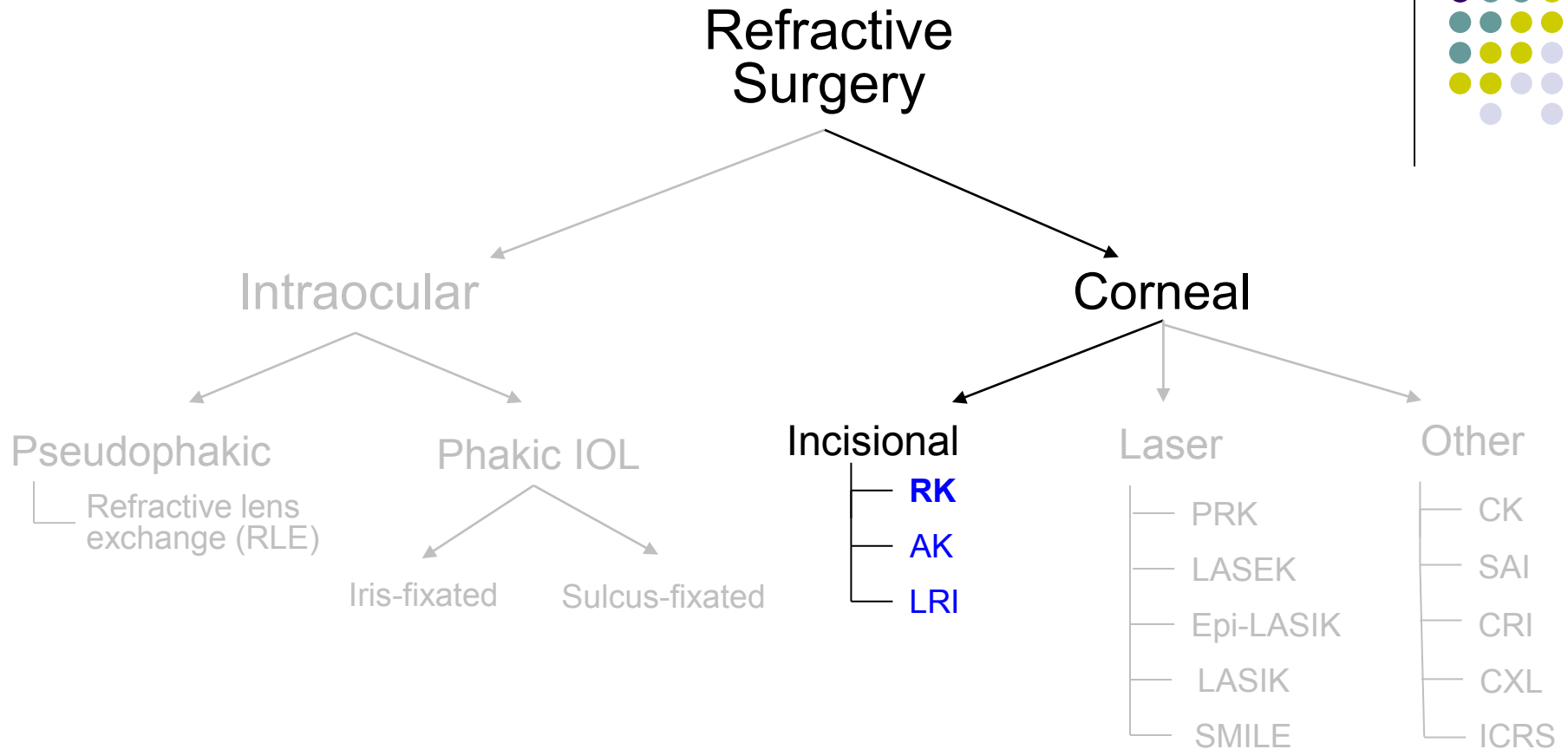
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Incisional Corneal Refractive Surgery



*What does **RK** stand for?*

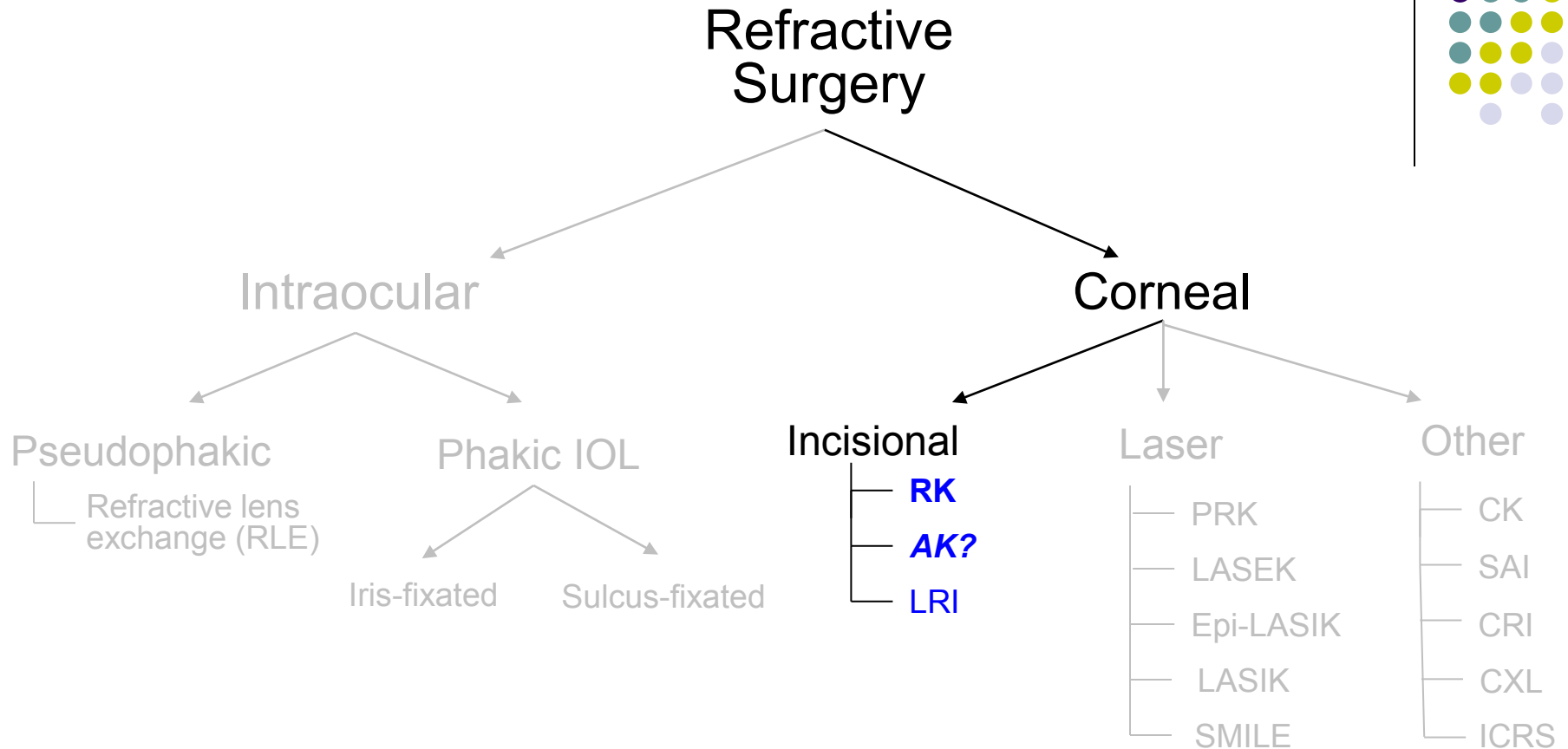
Incisional Corneal Refractive Surgery



*What does **RK** stand for?*

Radial **K**eratotomy

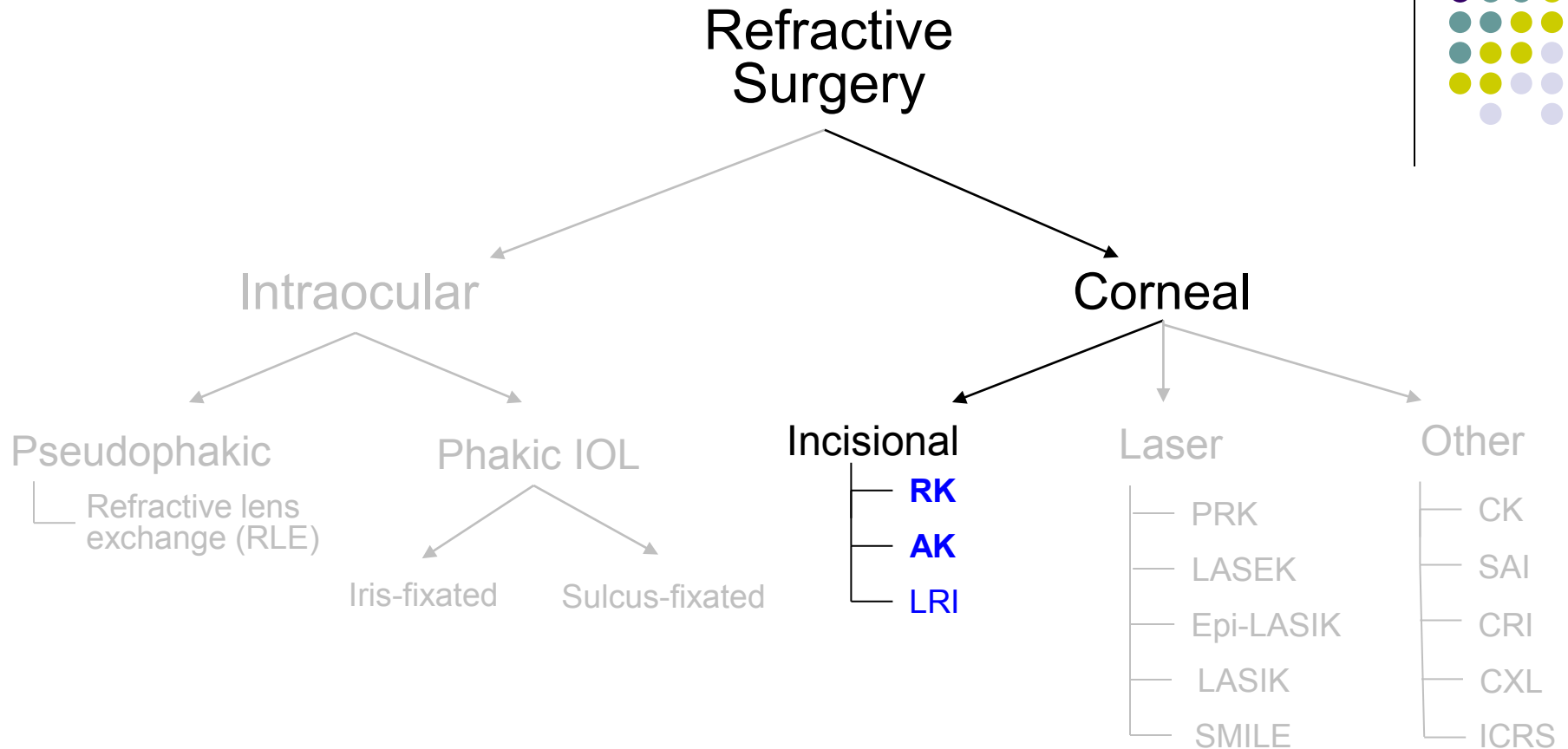
Incisional Corneal Refractive Surgery



What does **RK** stand for?
Radial **K**eratotomy

What does **AK** stand for?

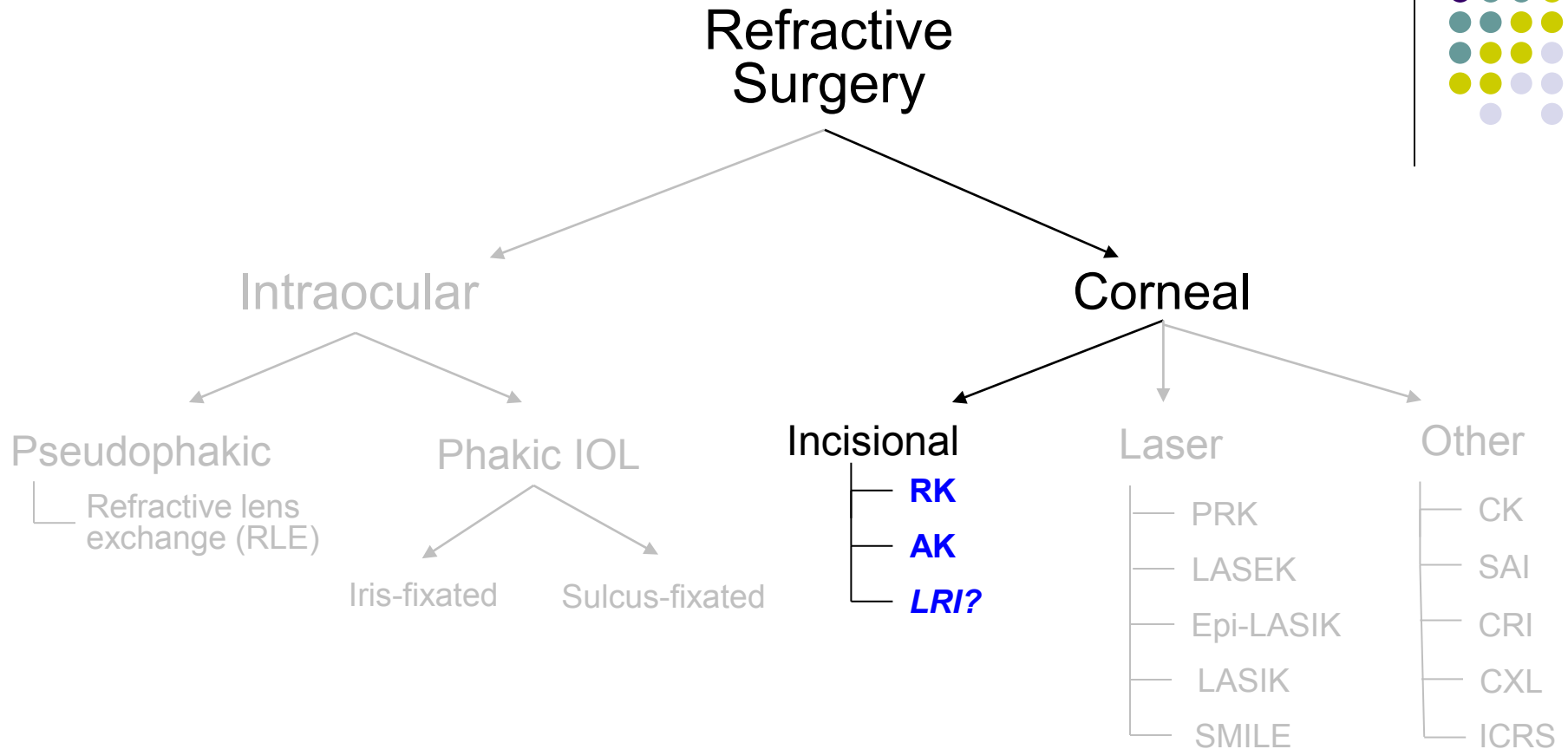
Incisional Corneal Refractive Surgery



*What does **RK** stand for?*
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Incisional Corneal Refractive Surgery

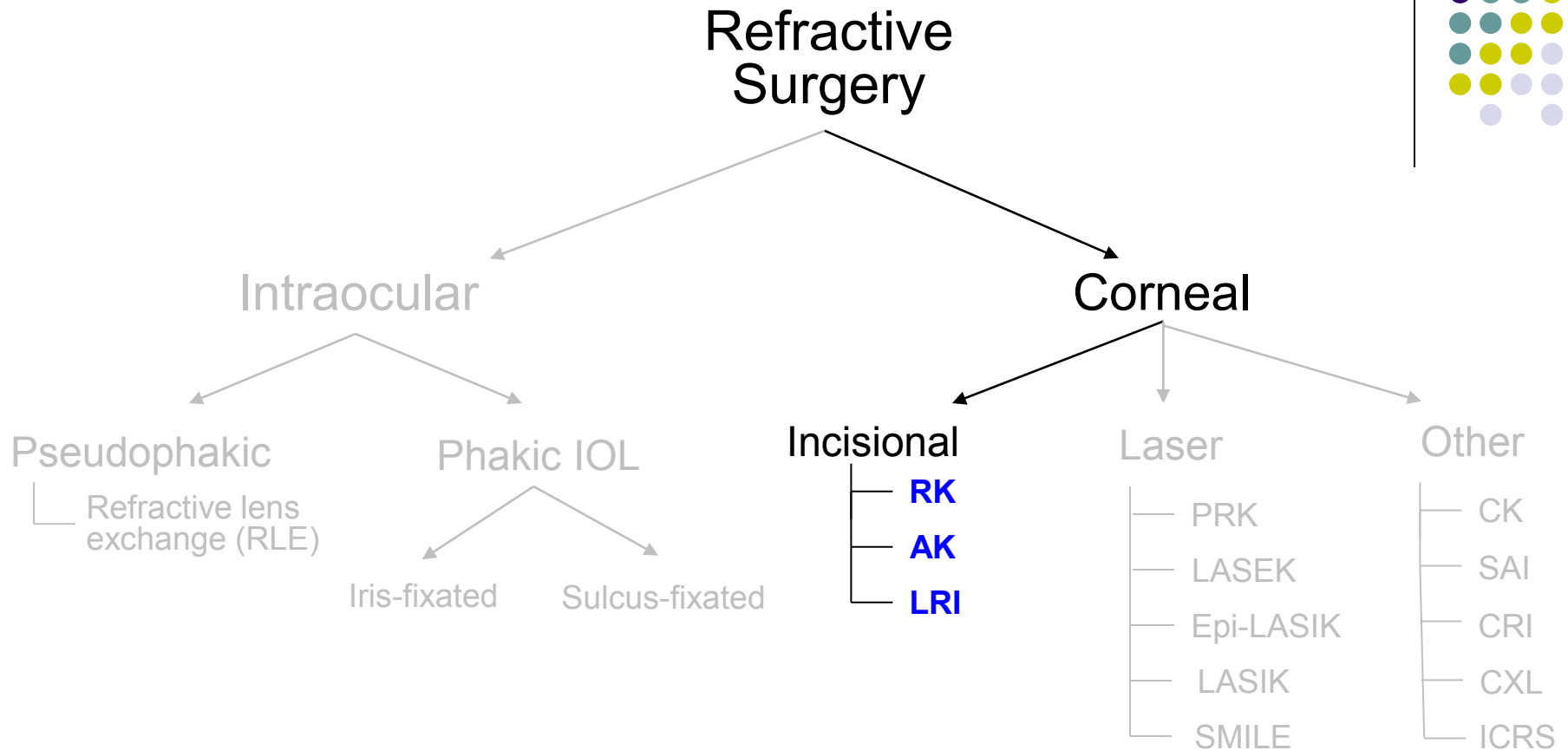


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Incisional Corneal Refractive Surgery



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Limbal **R**elaxing **I**ncisions

Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Corneal

Incisional

RK

AK

LRI

Laser

PRK

LASEK

Epi-LASIK

LASIK

SMILE

Other

CK

SAI

CRI

CXL

ICRS

What is the fundamental difference between RK vs AK/LRI (other than that RK is no longer performed)?

Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Pseudophakic

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Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

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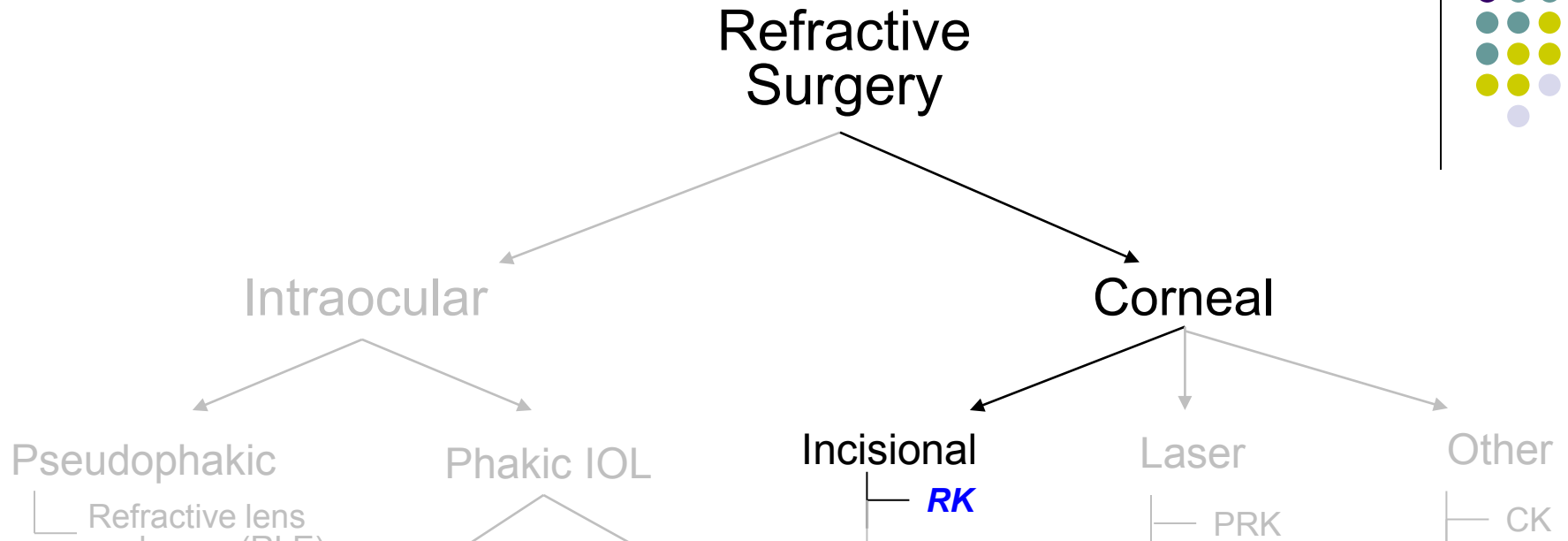
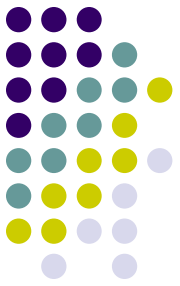
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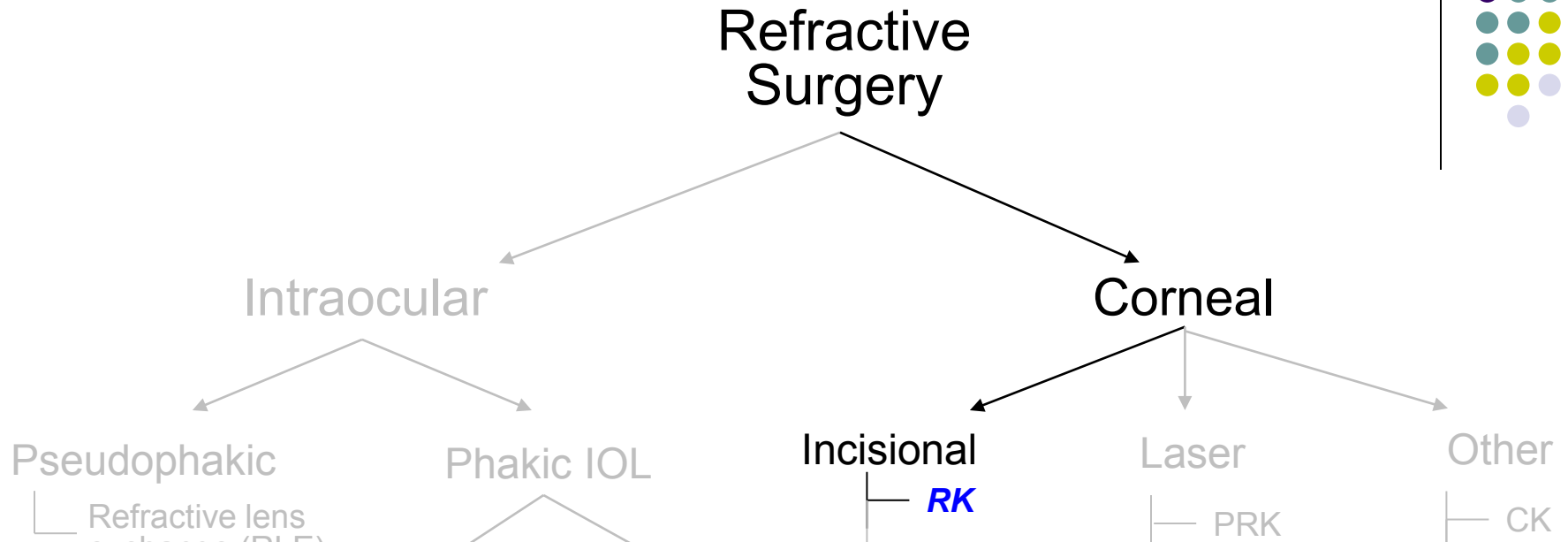
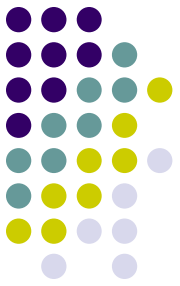
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Incisional Corneal Refractive Surgery



Briefly, how is RK performed?

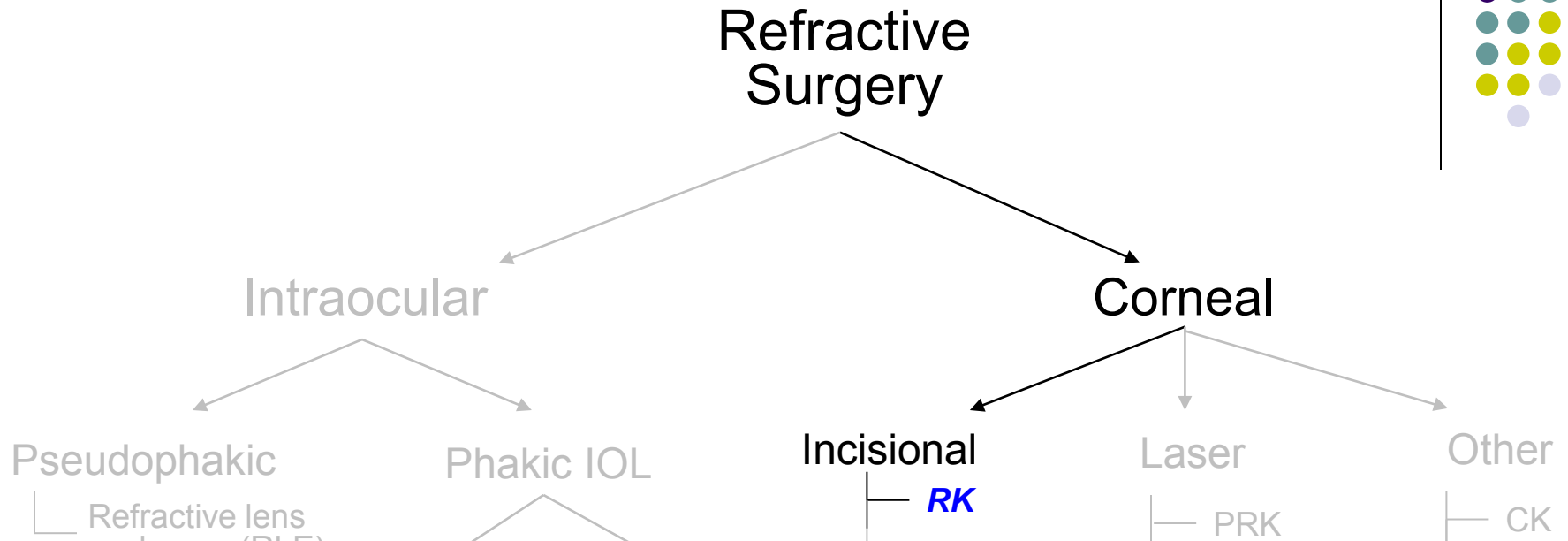
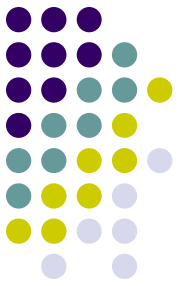
Incisional Corneal Refractive Surgery



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Incisional Corneal Refractive Surgery

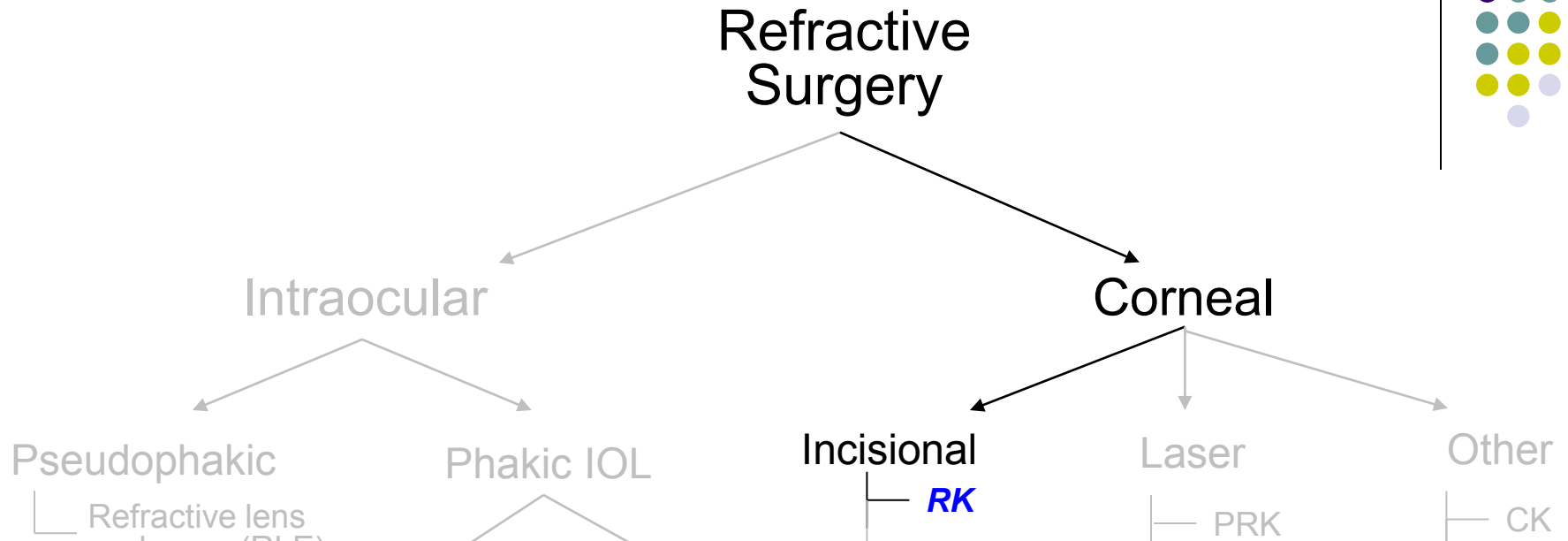


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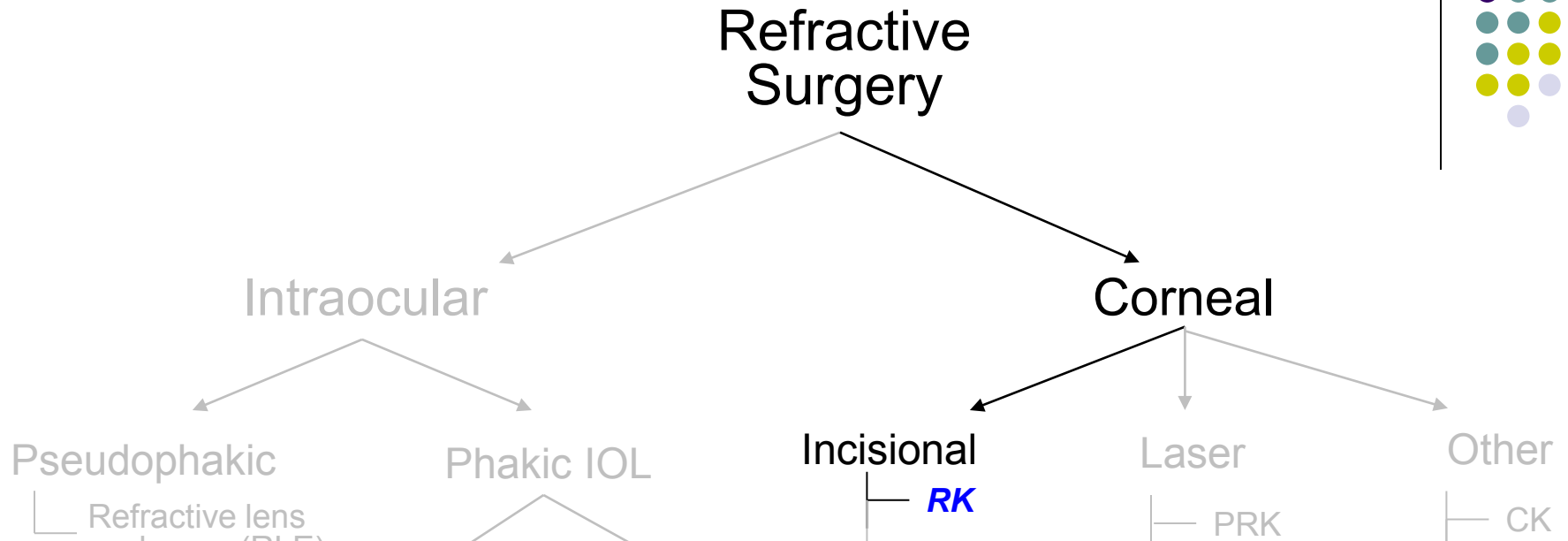
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Incisional Corneal Refractive Surgery



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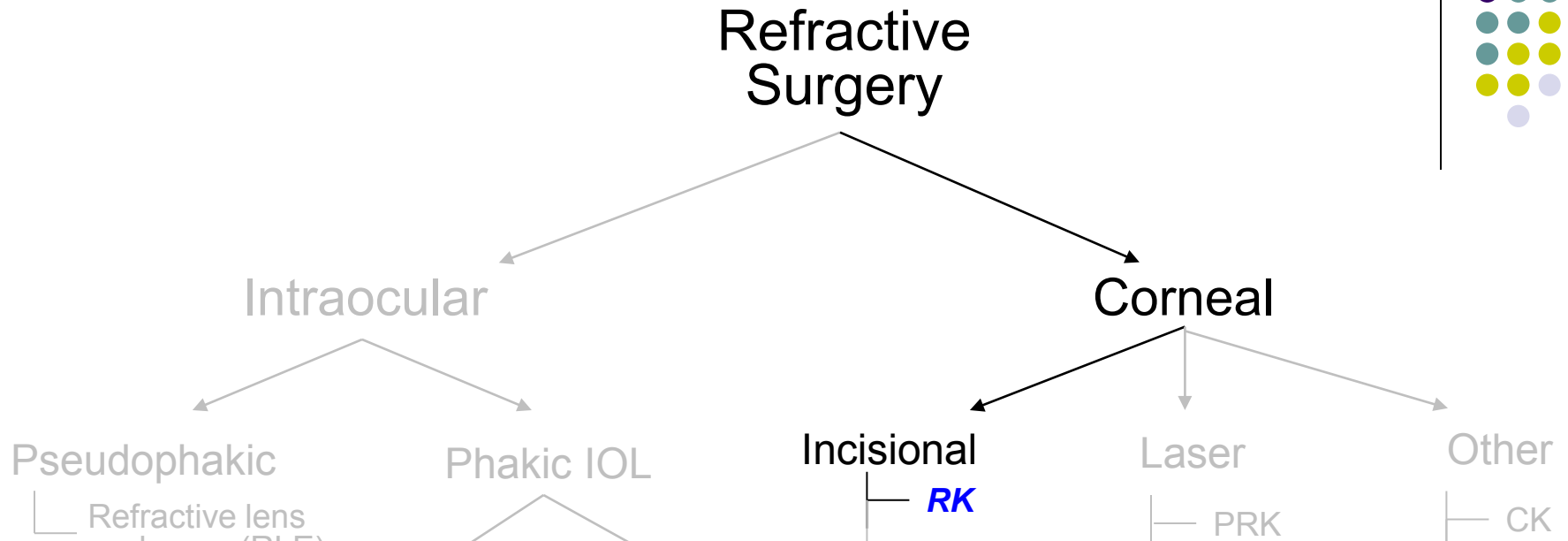
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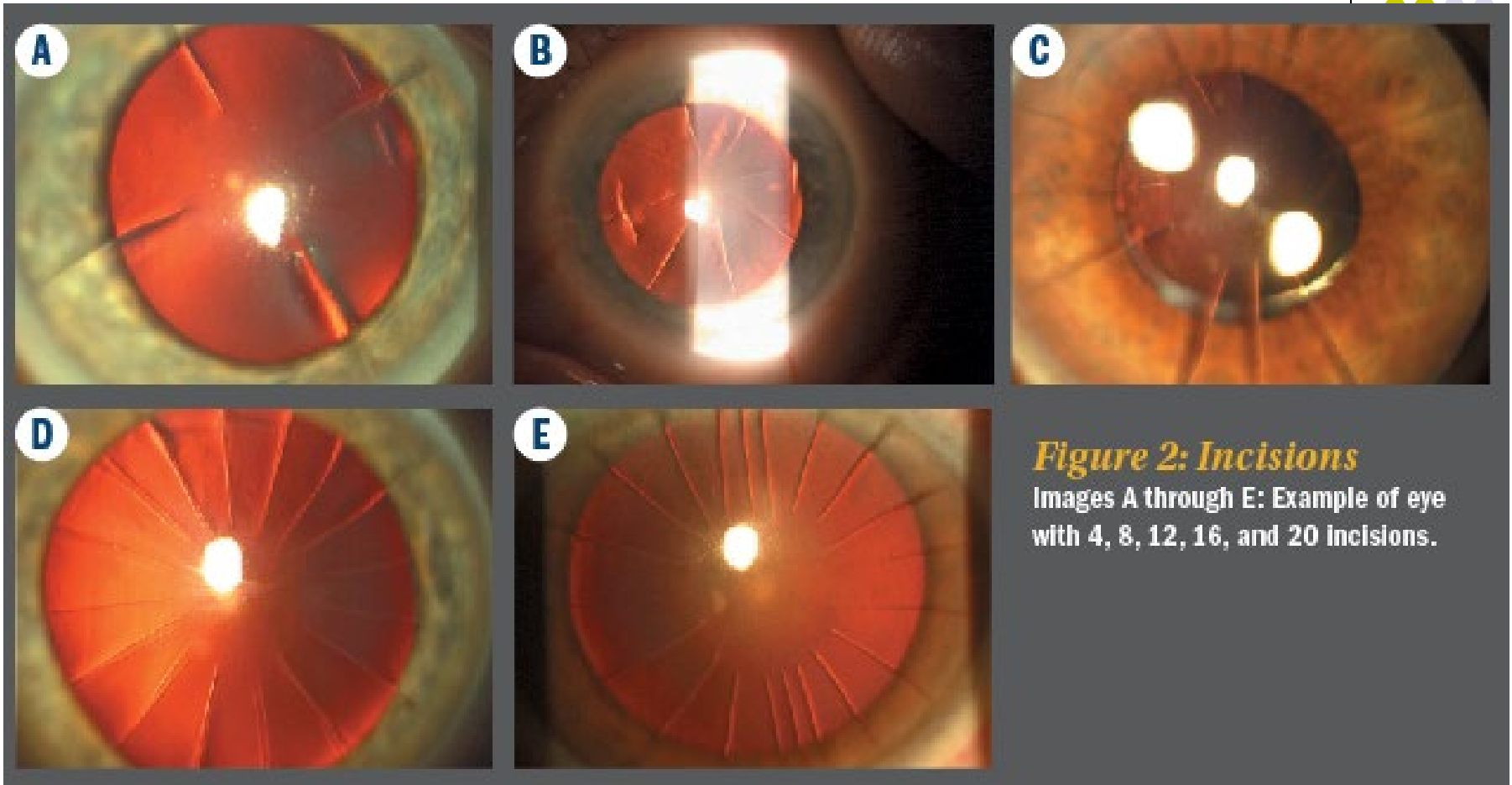
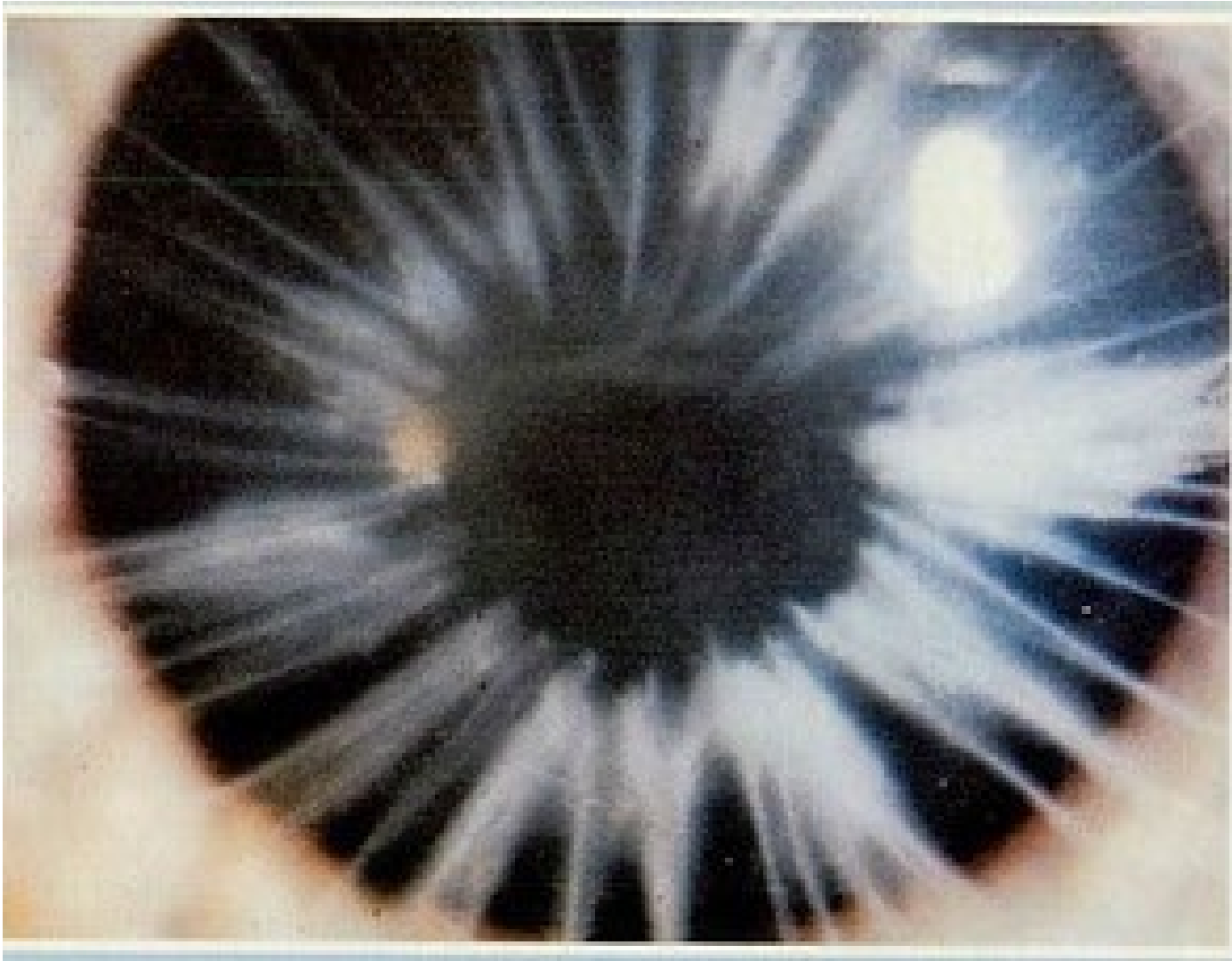


Figure 2: Incisions

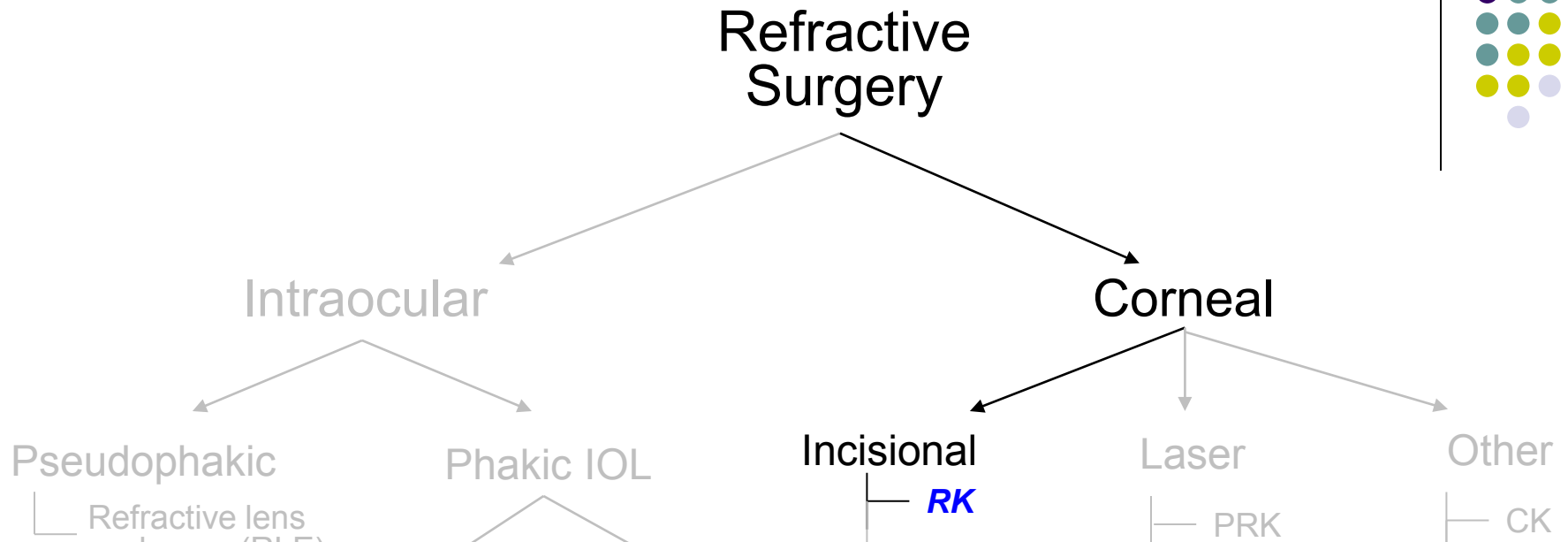
Images A through E: Example of eye with 4, 8, 12, 16, and 20 incisions.

Radial keratotomy



Radial keratotomy: 78 incisions!

Incisional Corneal Refractive Surgery



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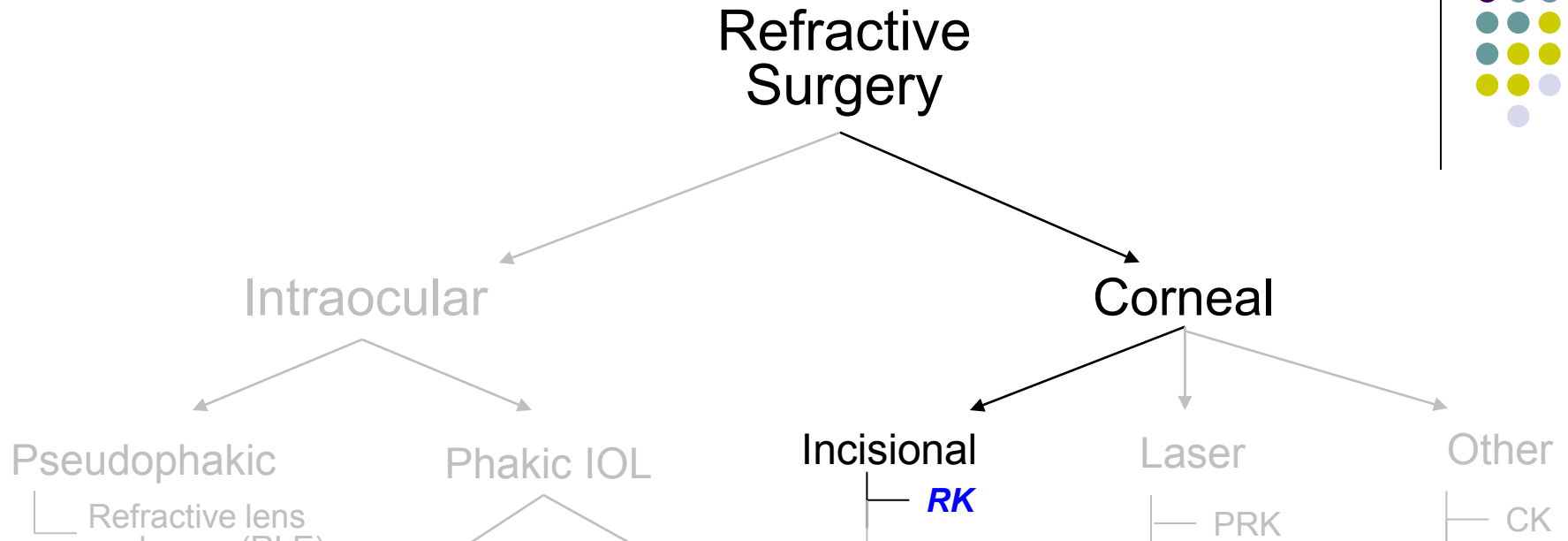
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Incisional Corneal Refractive Surgery



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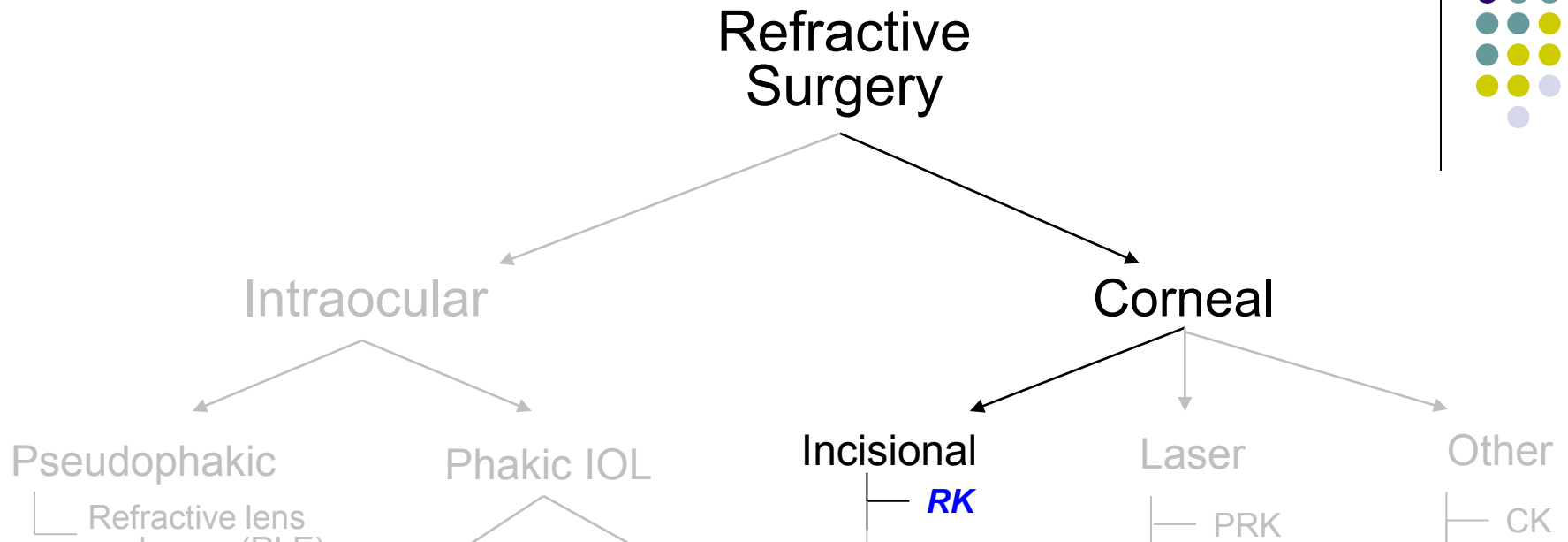
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The radial cuts gape, causing the peripheral cornea to bulge. This steepens the peripheral cornea, which in turn flattens the central cornea.

steepens vs
flattens

steepens vs
flattens

Incisional Corneal Refractive Surgery



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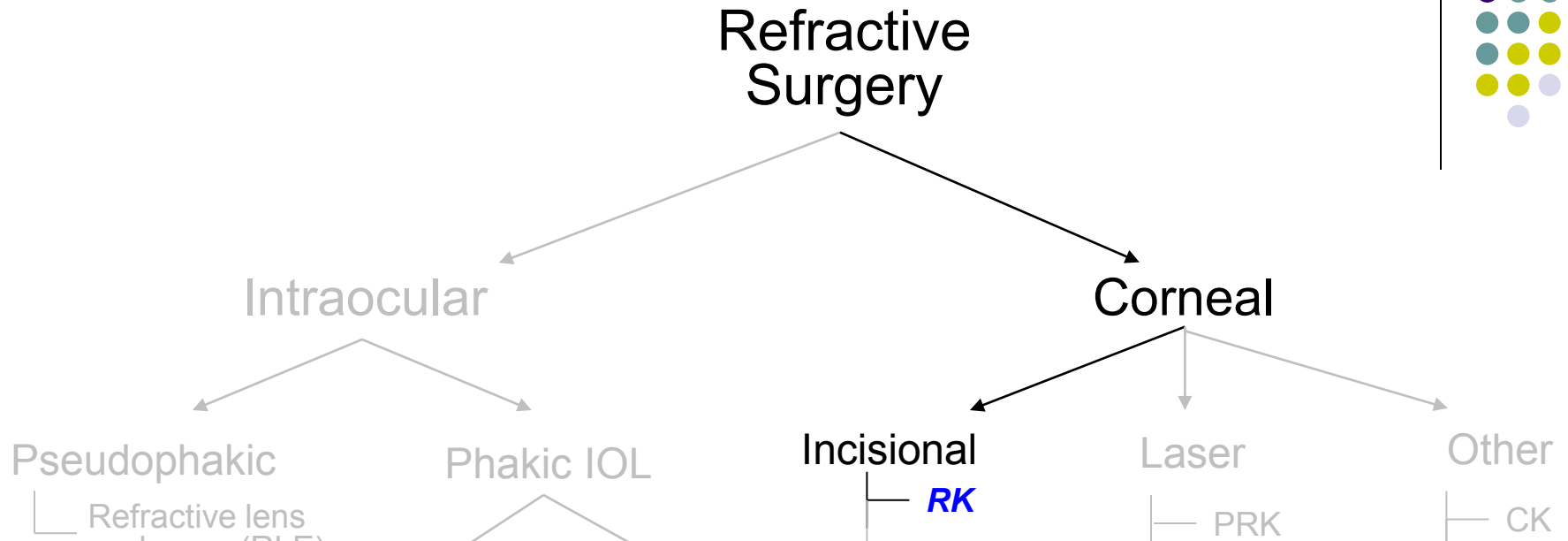
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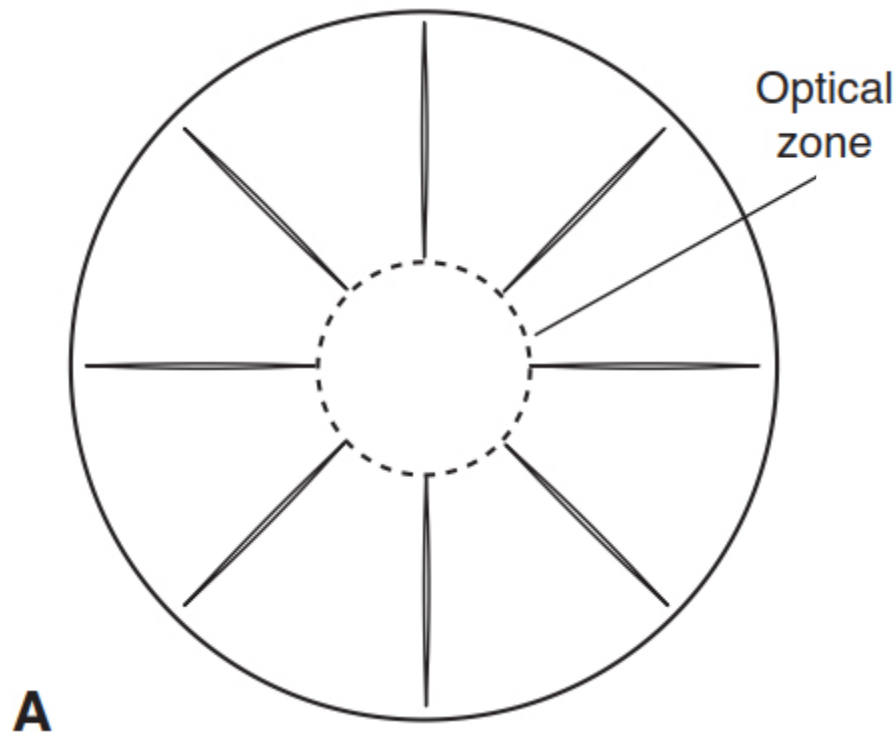
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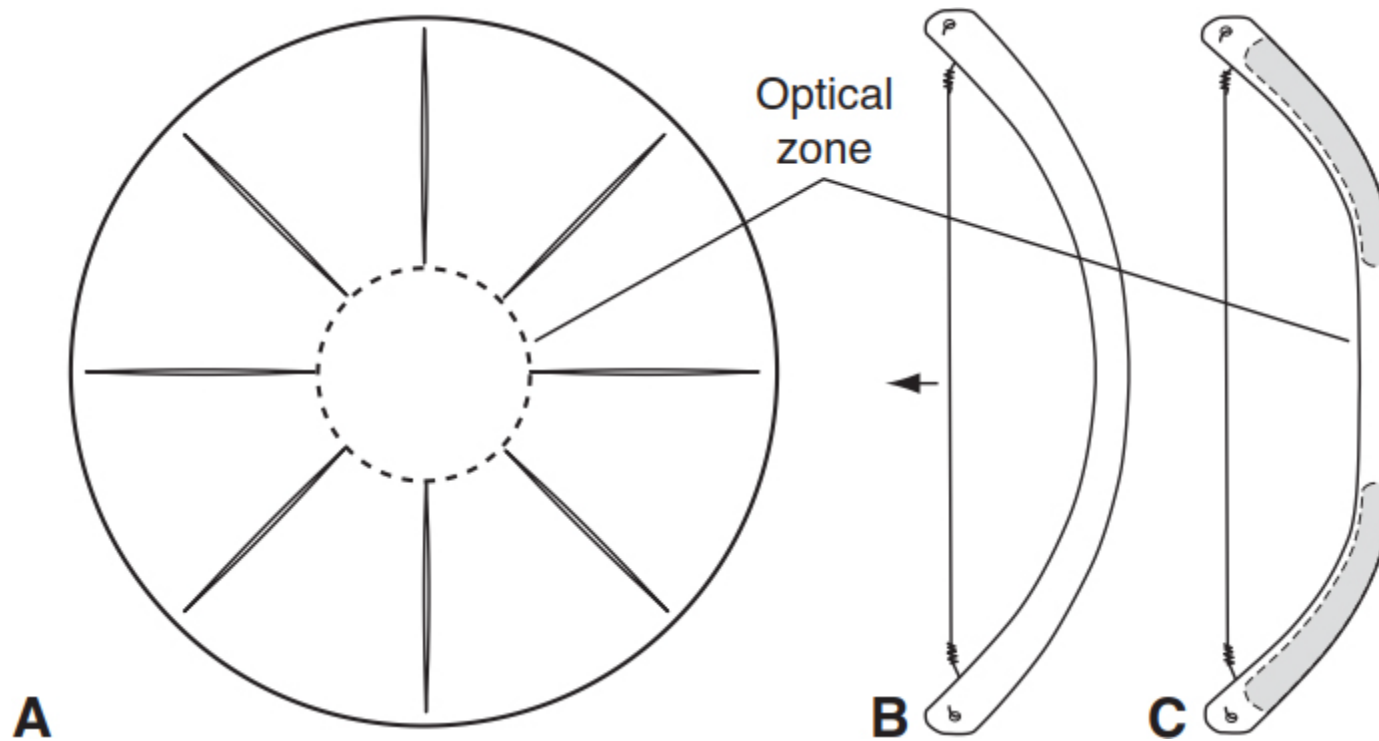
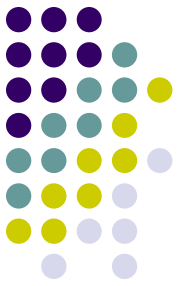
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Incisional Corneal Refractive Surgery



Schematic diagrams of the effect of radial incisions. **A**, 8-incision radial keratotomy (RK) with circular central optical zone (*dashed circle*), which shows the limit of the inner incision length.

Incisional Corneal Refractive Surgery



Schematic diagrams of the effect of radial incisions. **A**, 8-incision radial keratotomy (RK) with circular central optical zone (*dashed circle*), which shows the limit of the inner incision length. **B**, Cross-sectional view of the cornea, **pre-RK**. **C**, **Post-RK** the corneal periphery steepens, thereby inducing flattening in the central cornea.

Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Corneal

Incisional

RK

Laser

PRK

Other

CK

What is the fundamental difference between RK vs AK/LRI (other than that RK is no longer performed)?

RK is (was) used to correct myopia

whereas AK/LRI are used to correct astigmatism

central cornea to the edge of the 'optical zone' (central portion of the cornea bounded by a 6mm diameter ring)

This is why RK can't be used to treat hyperopia.

How
Quit

How
Usu

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Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Corneal

Pseudophakic

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Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Corneal

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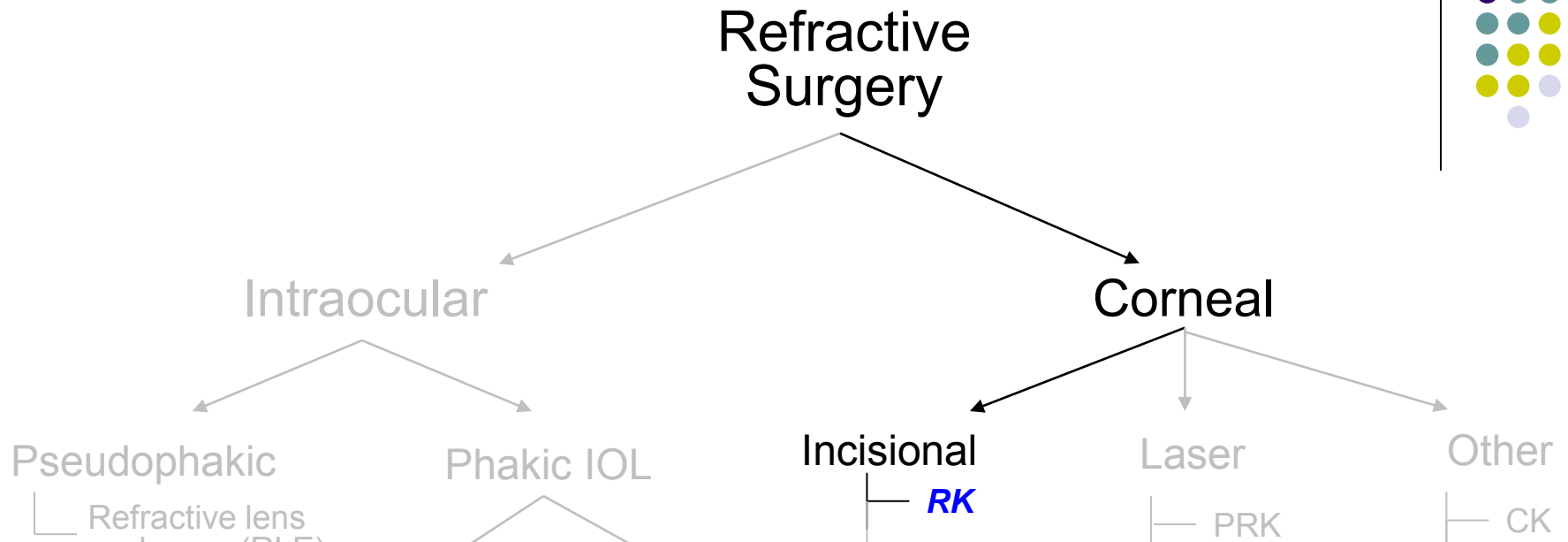
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Incisional Corneal Refractive Surgery



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How many cuts are made?

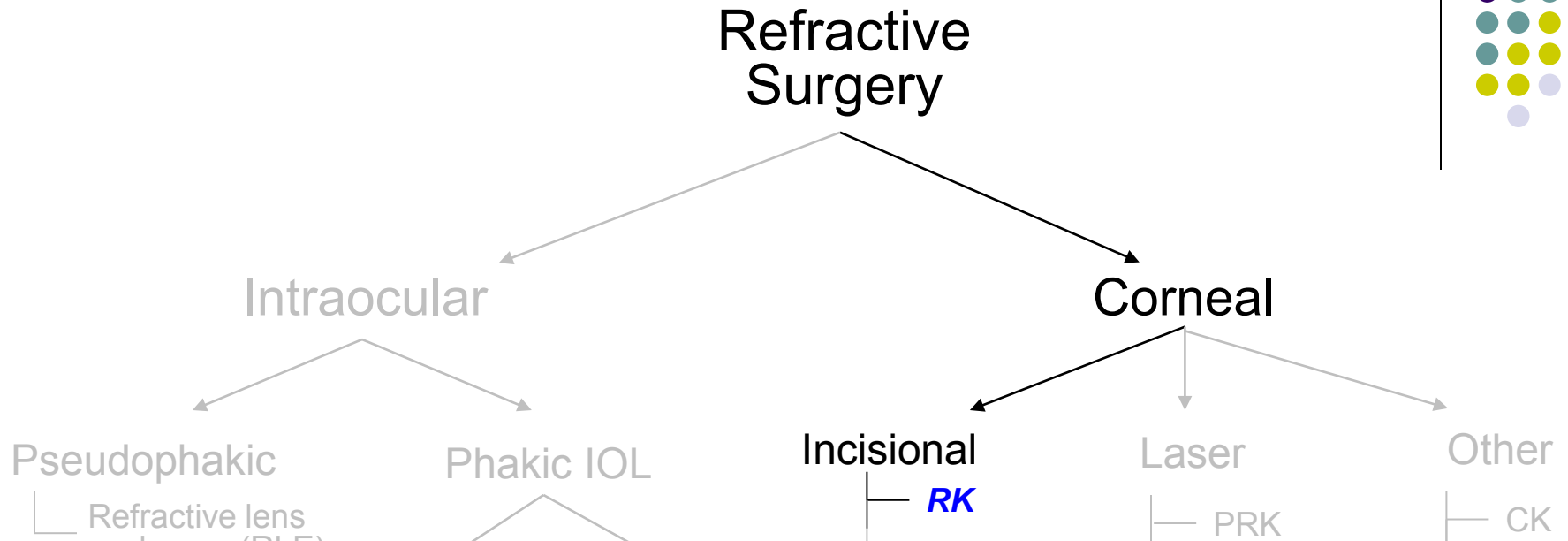
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Steepening of the peripheral cornea leads inevitably to an increase in which higher-order aberration?

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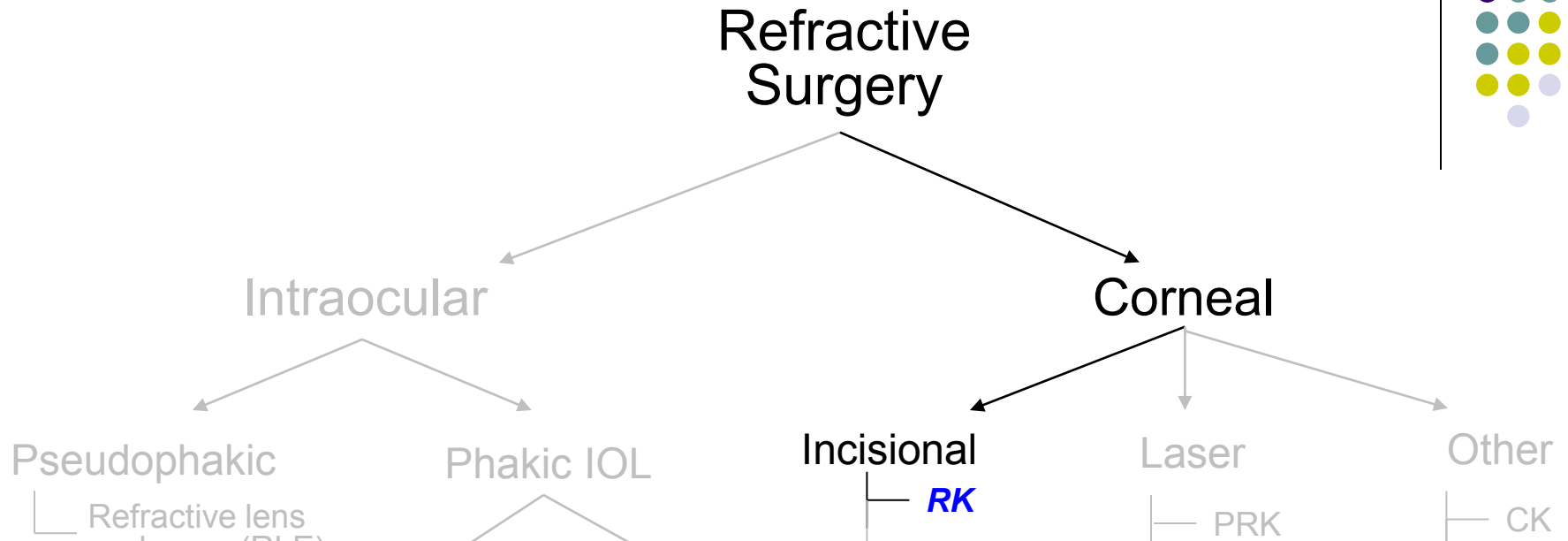
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Spherical aberration

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Incisional Corneal Refractive Surgery



Briefly, how is RK performed?

Radial incisions are made that extend from the peripheral cornea to the edge of the 'optical zone' (central portion)

The native, normal cornea is steeper centrally than it is peripherally. What is the term for this shape?

How does RK work?

Quite different

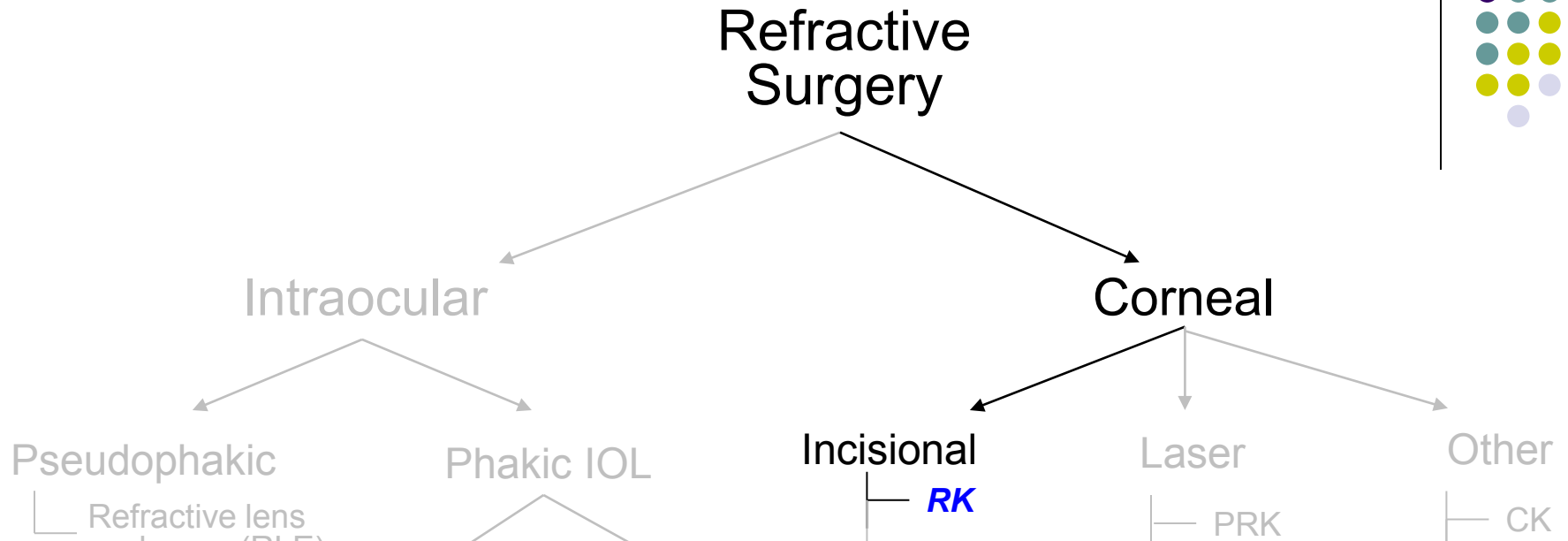
How many incisions?

Usually 6-8

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Incisional Corneal Refractive Surgery



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Prolate

How does RK correct myopia?

Quite different

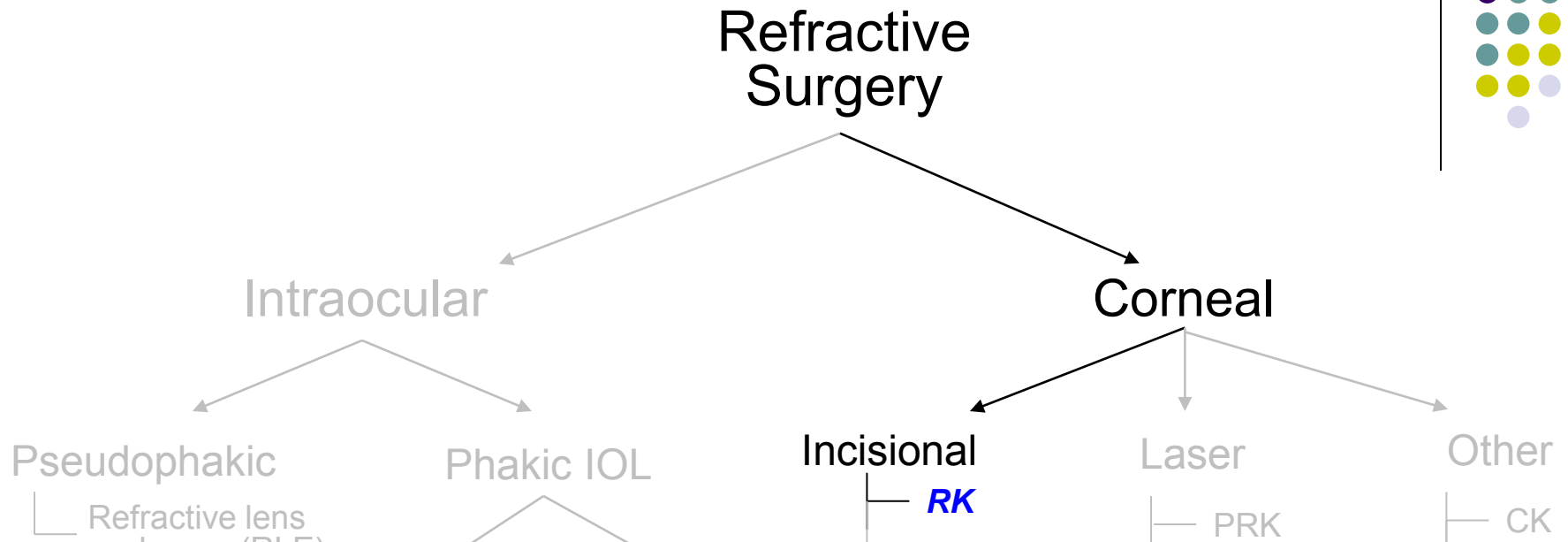
How much correction?

Usually

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Incisional Corneal Refractive Surgery



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How does it look? **Prolate**

Quite different

How much steeper?

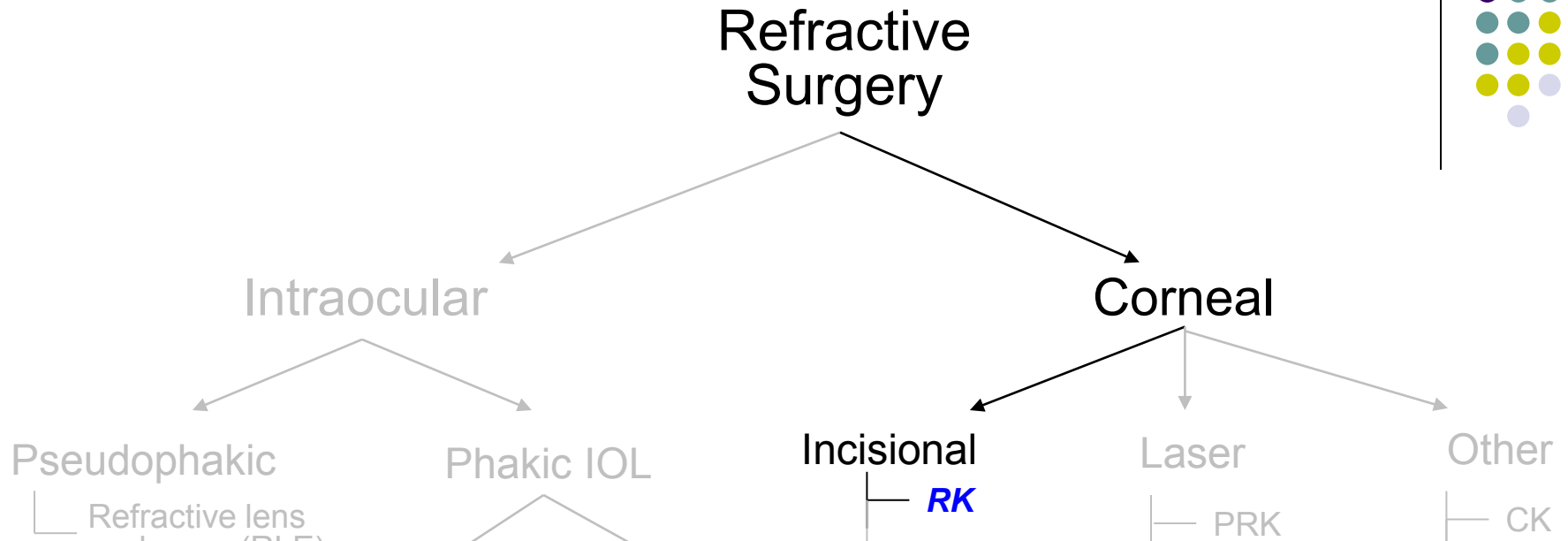
Usually

How much steeper (in diopters) is the typical central cornea than the typical peripheral cornea?

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Incisional Corneal Refractive Surgery



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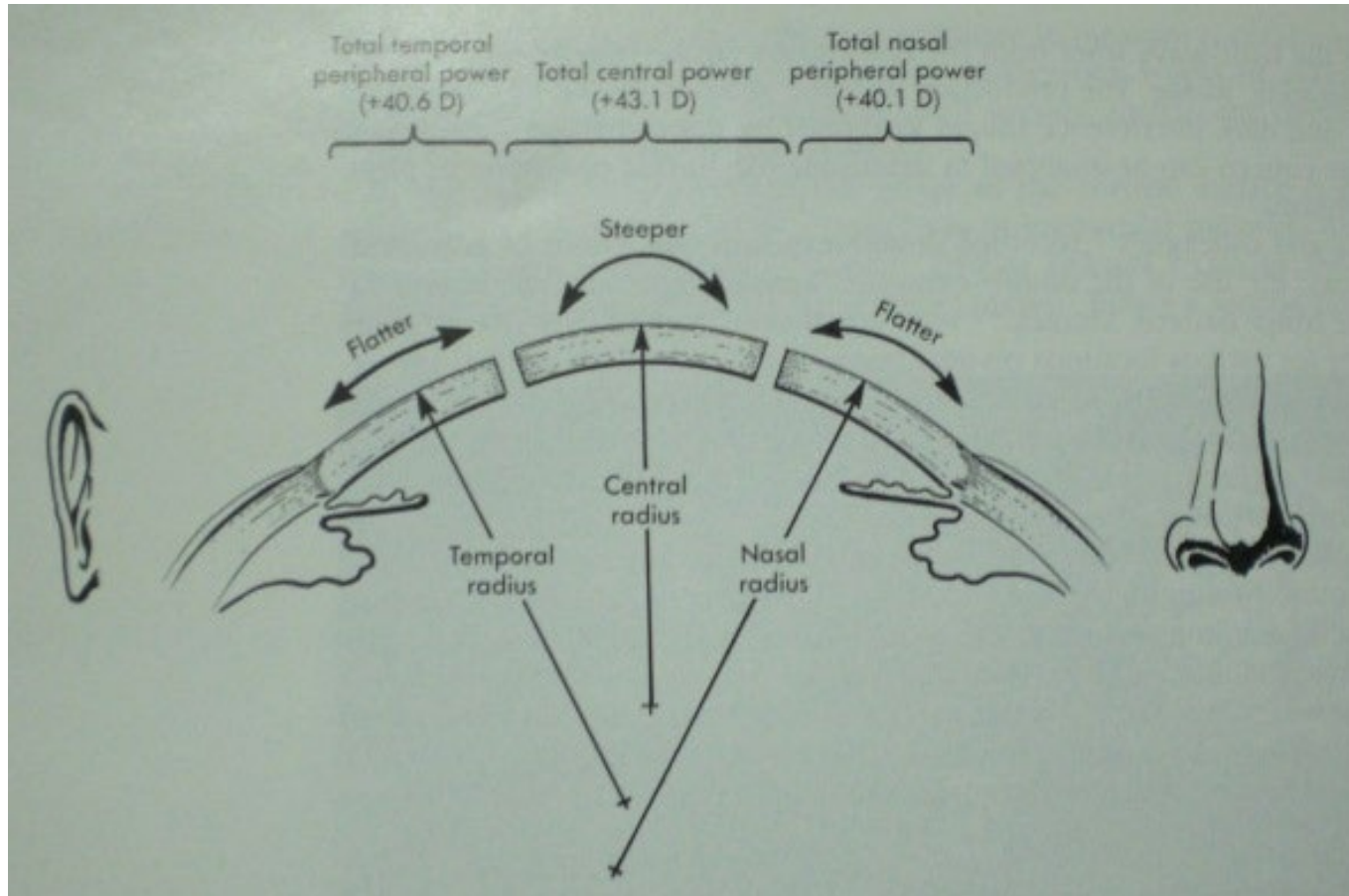
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3-4

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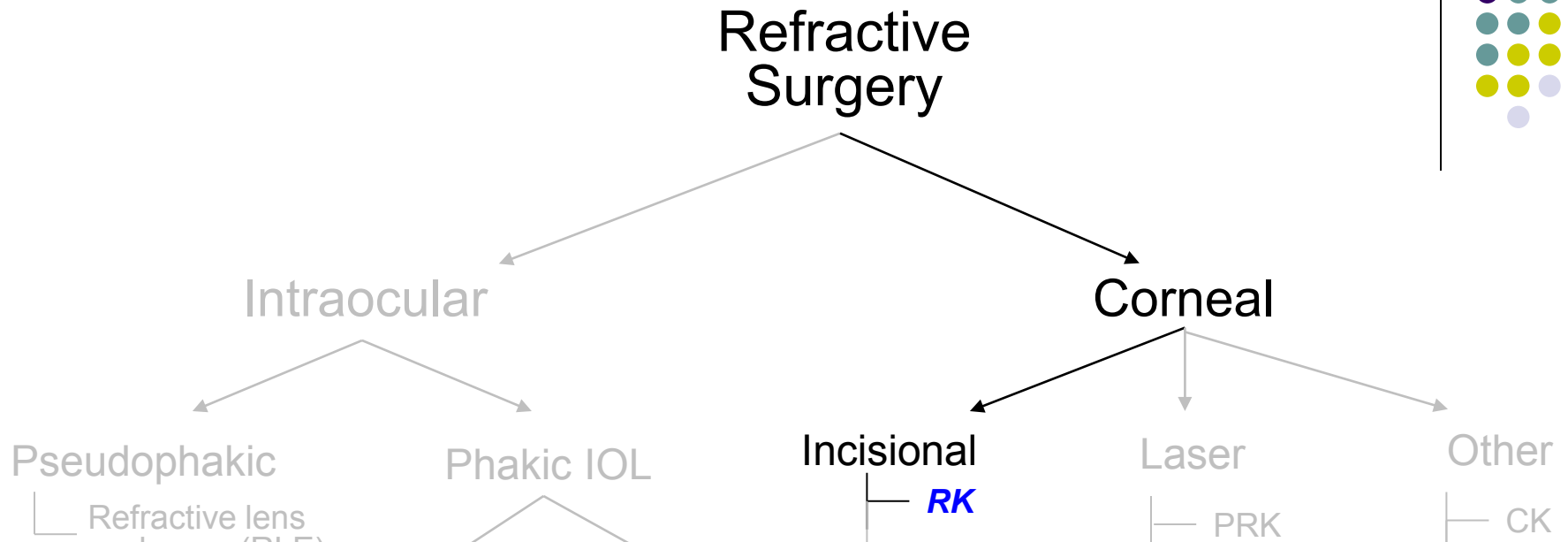
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Incisional Corneal Refractive Surgery



Power differential of central vs peripheral virgin cornea

Incisional Corneal Refractive Surgery



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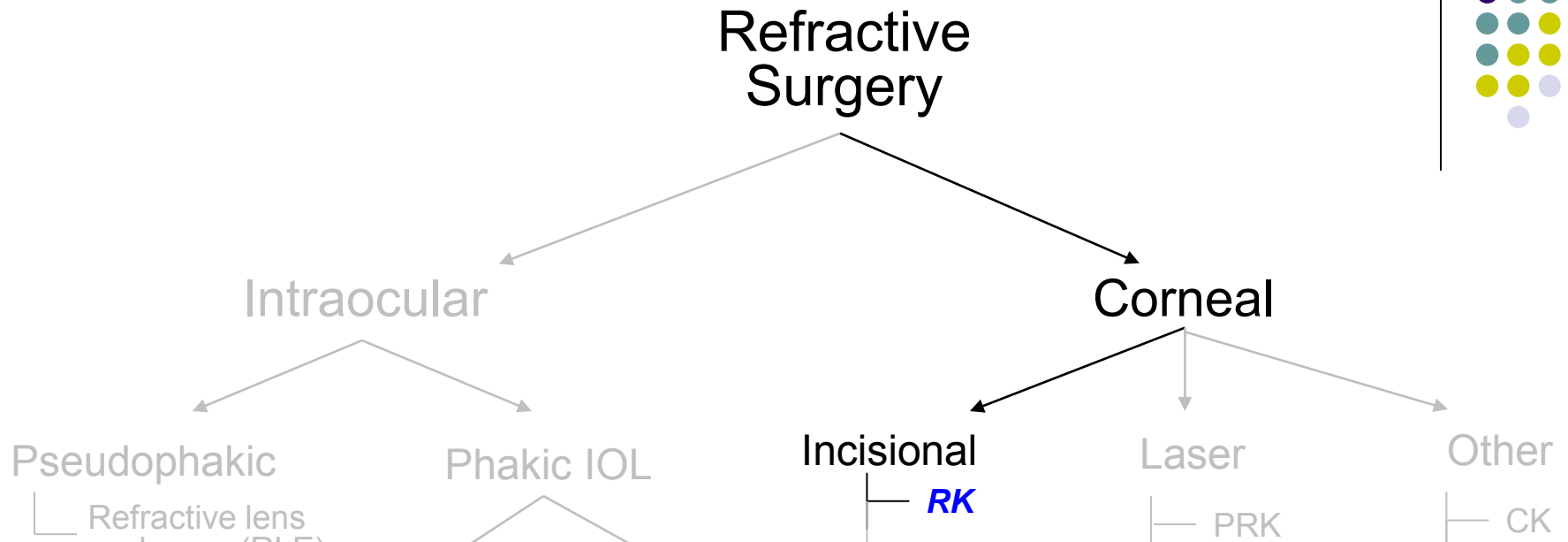
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Oblate

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Incisional Corneal Refractive Surgery



Refractive
Surgery

Intraocular

Corneal

For more, see the slide-set Corneal Optics (RS3)

Pse

Refractive lens

RK

PRK

CK

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Prolate

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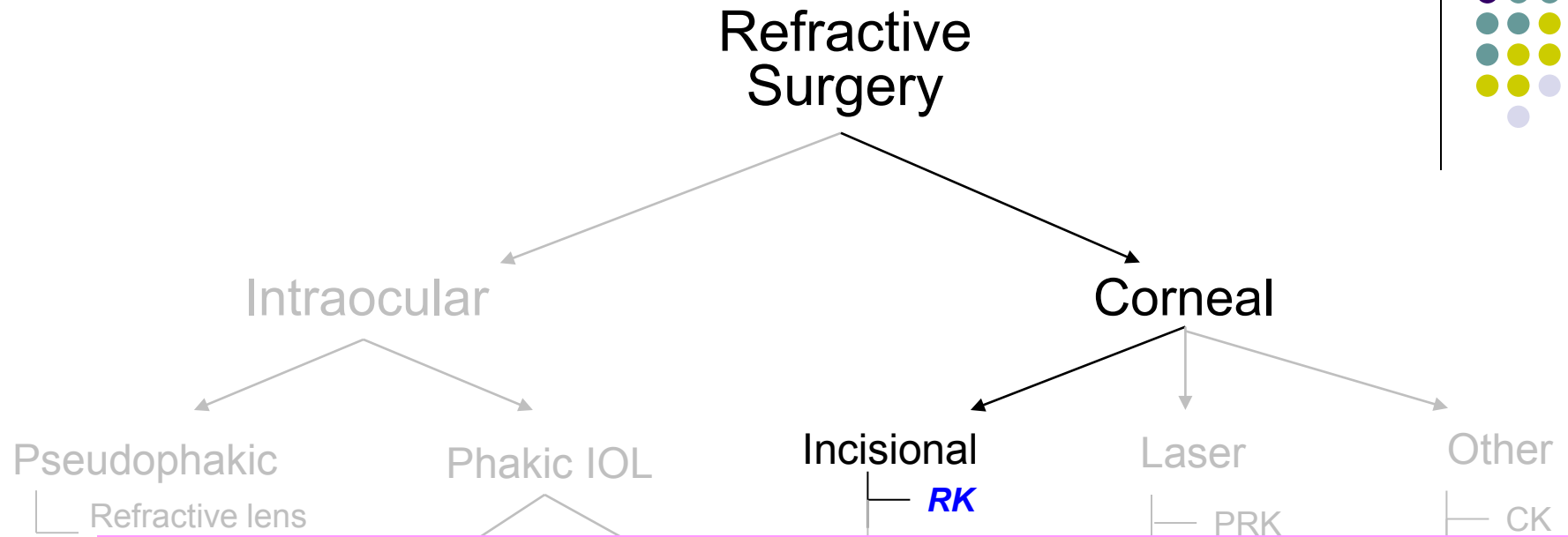
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Incisional Corneal Refractive Surgery



*In two words, what is the main **short-term** problem with RK?*

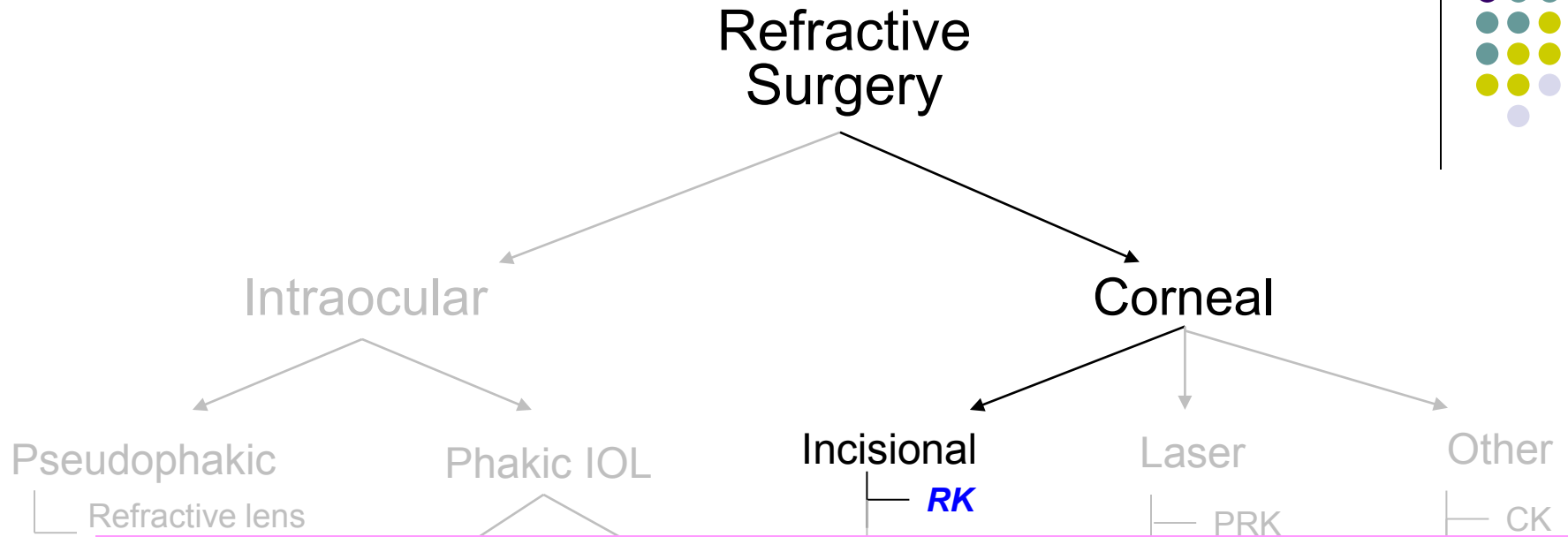
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Incisional Corneal Refractive Surgery



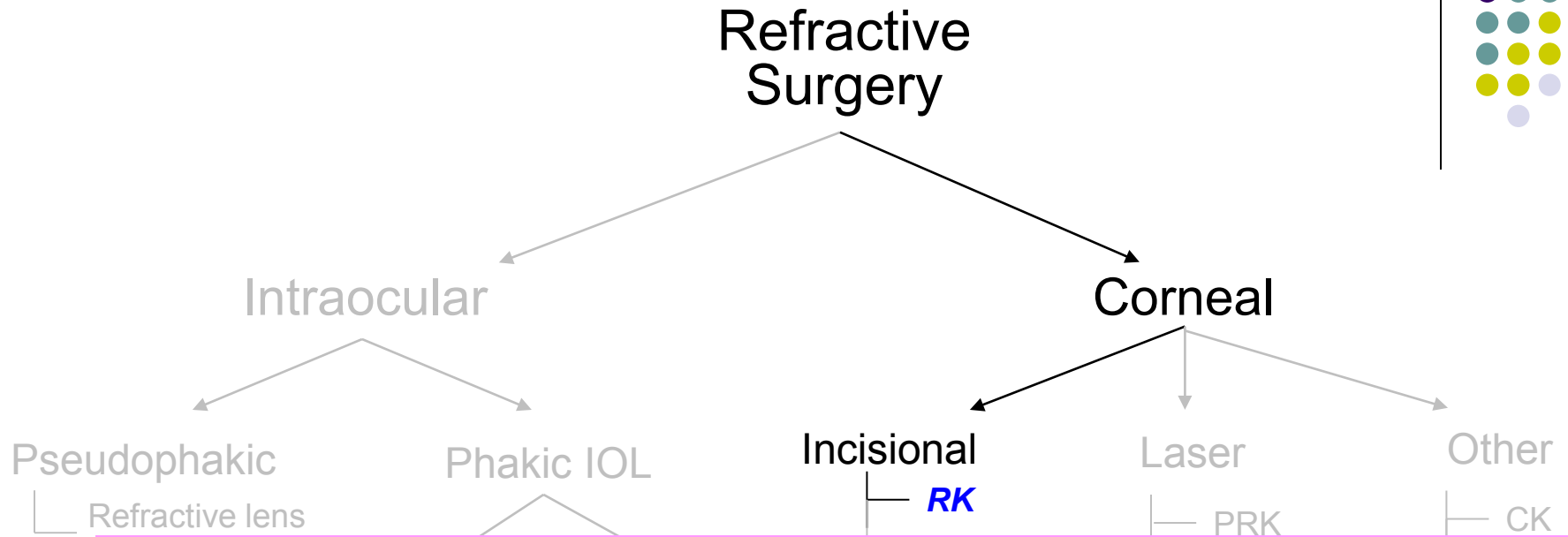
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portion

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Incisional Corneal Refractive Surgery



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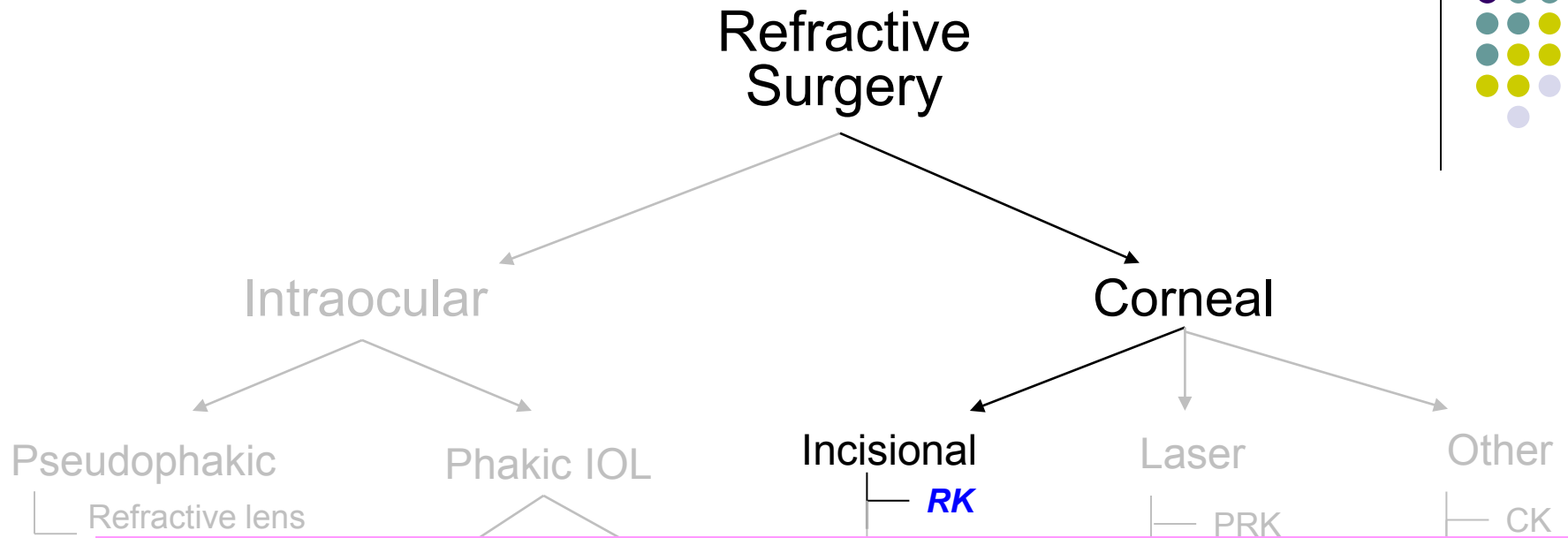
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Incisional Corneal Refractive Surgery

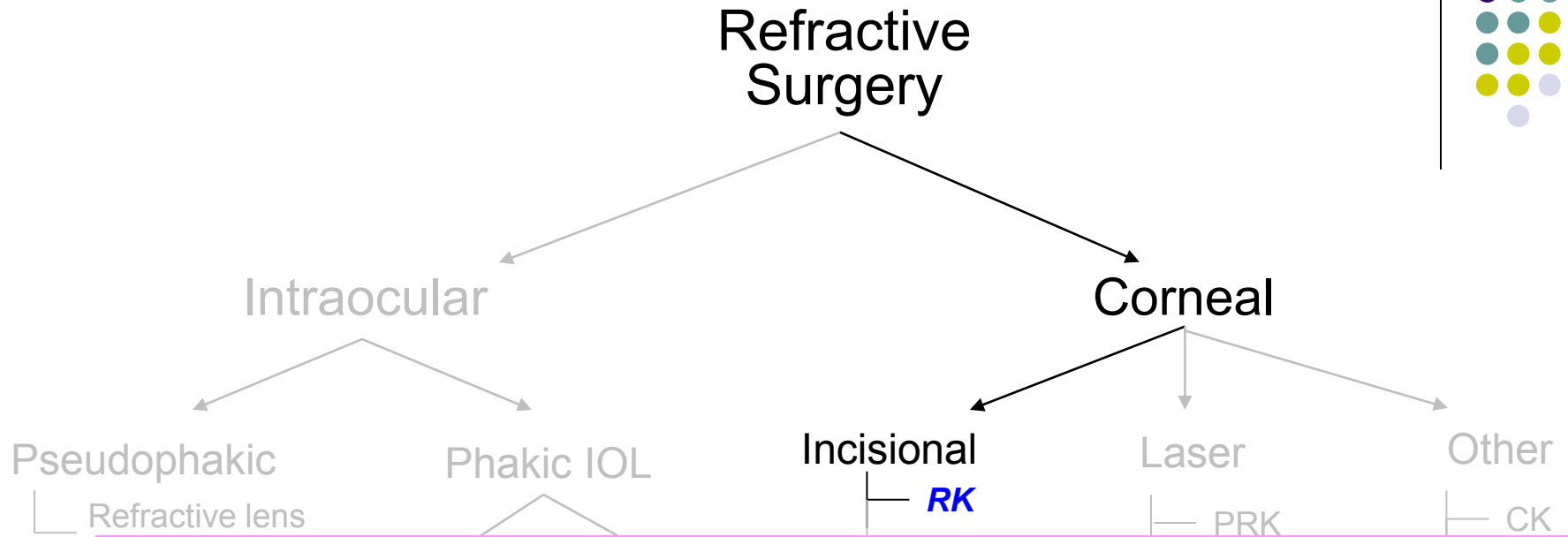


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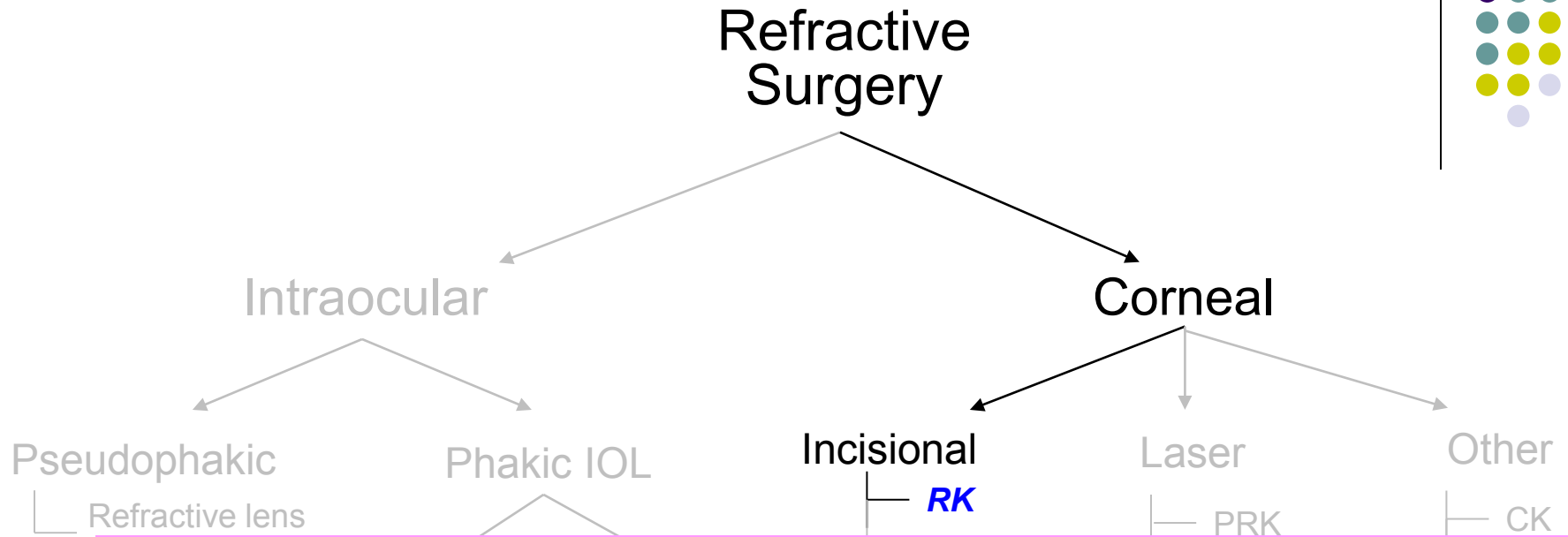
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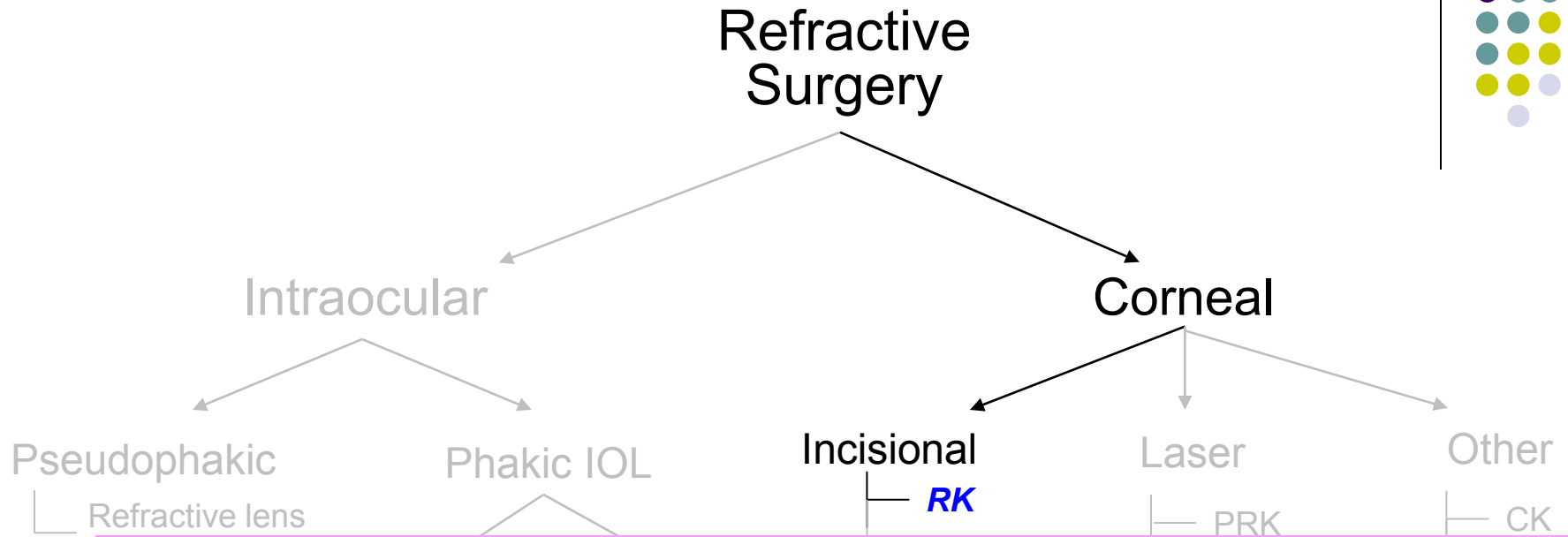
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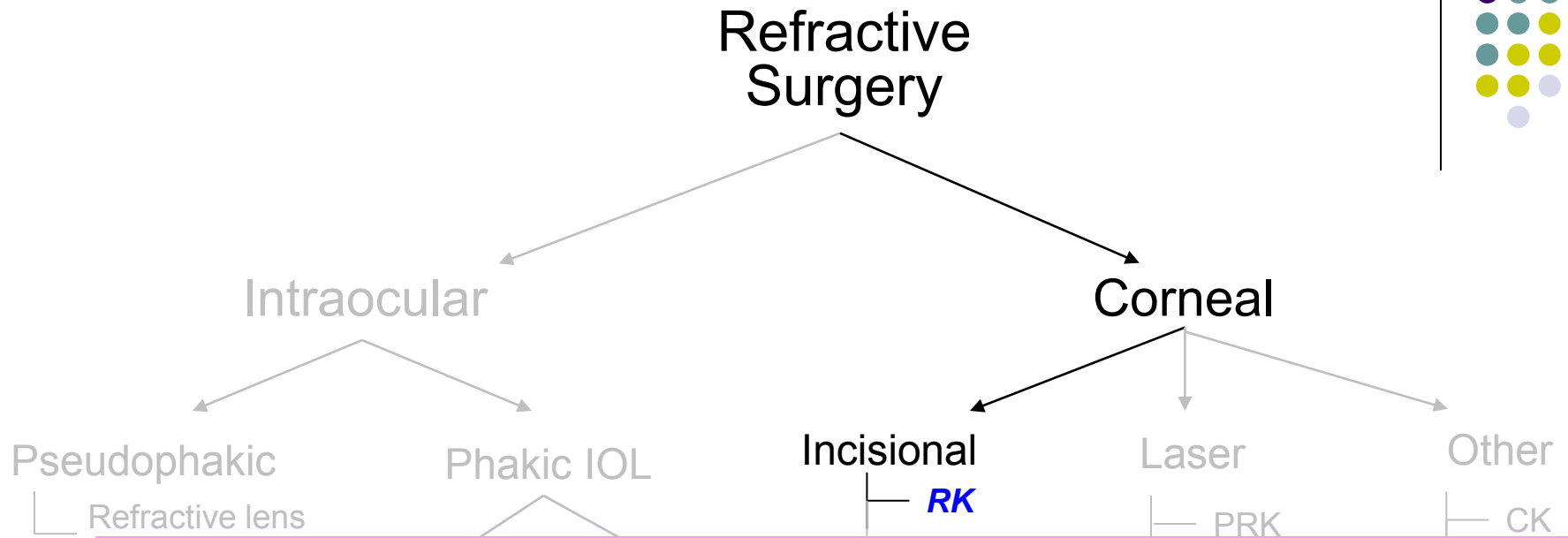
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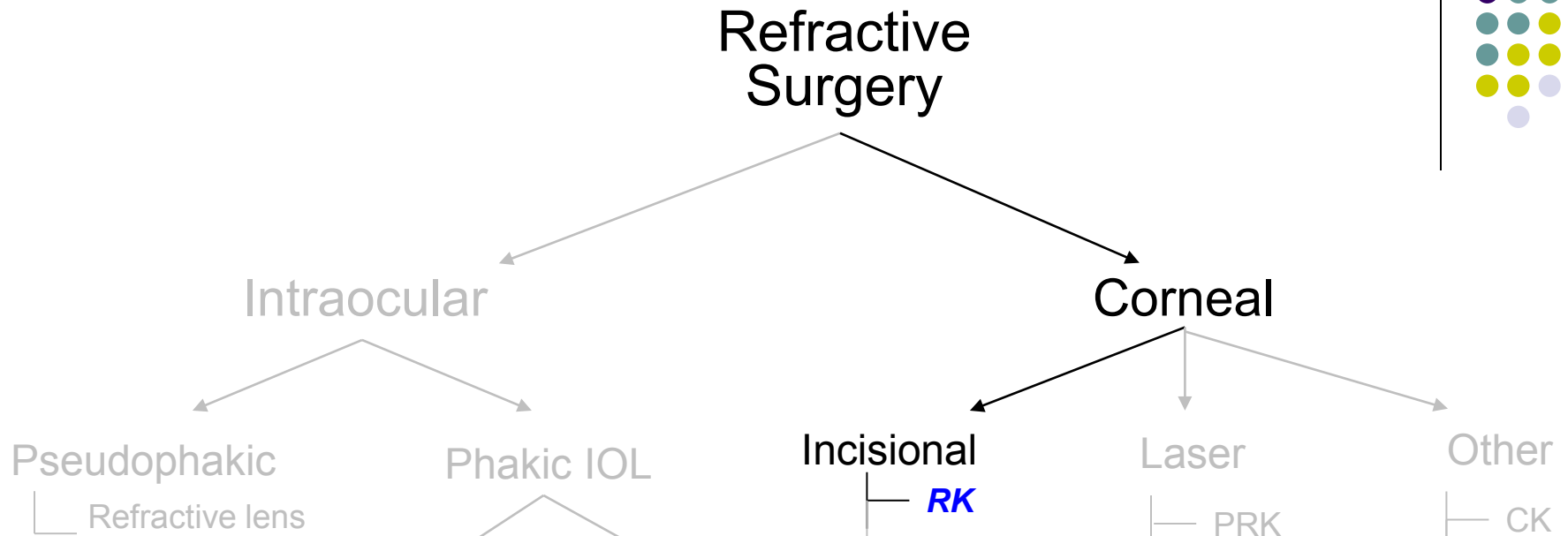
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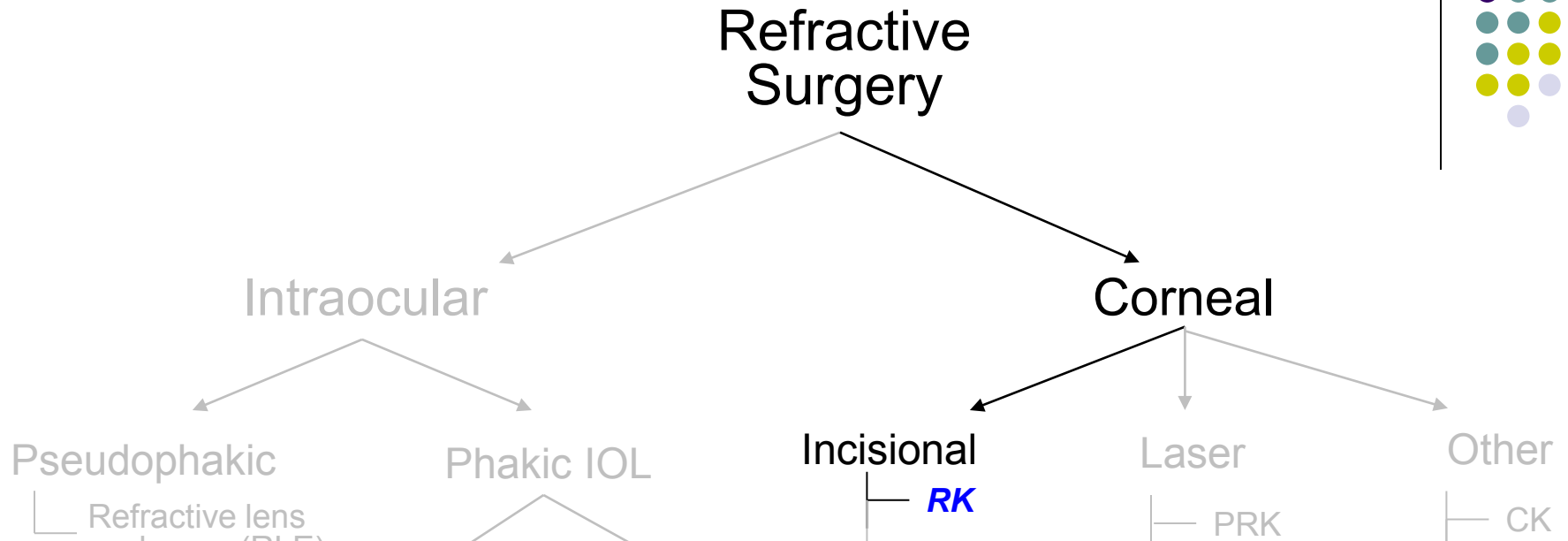
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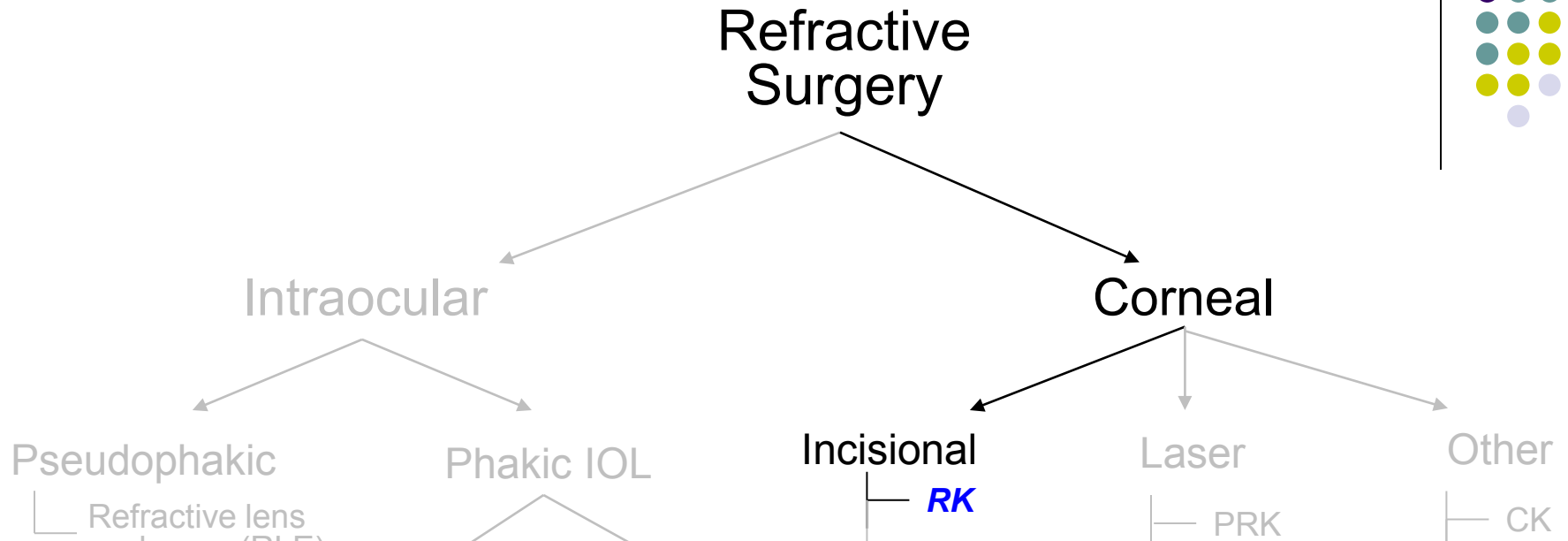
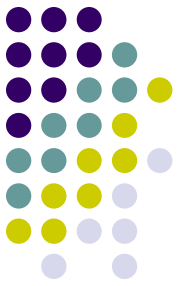
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Quite (Note: 'Hyperopic drift' is AKA *progressive flattening effect of surgery*)

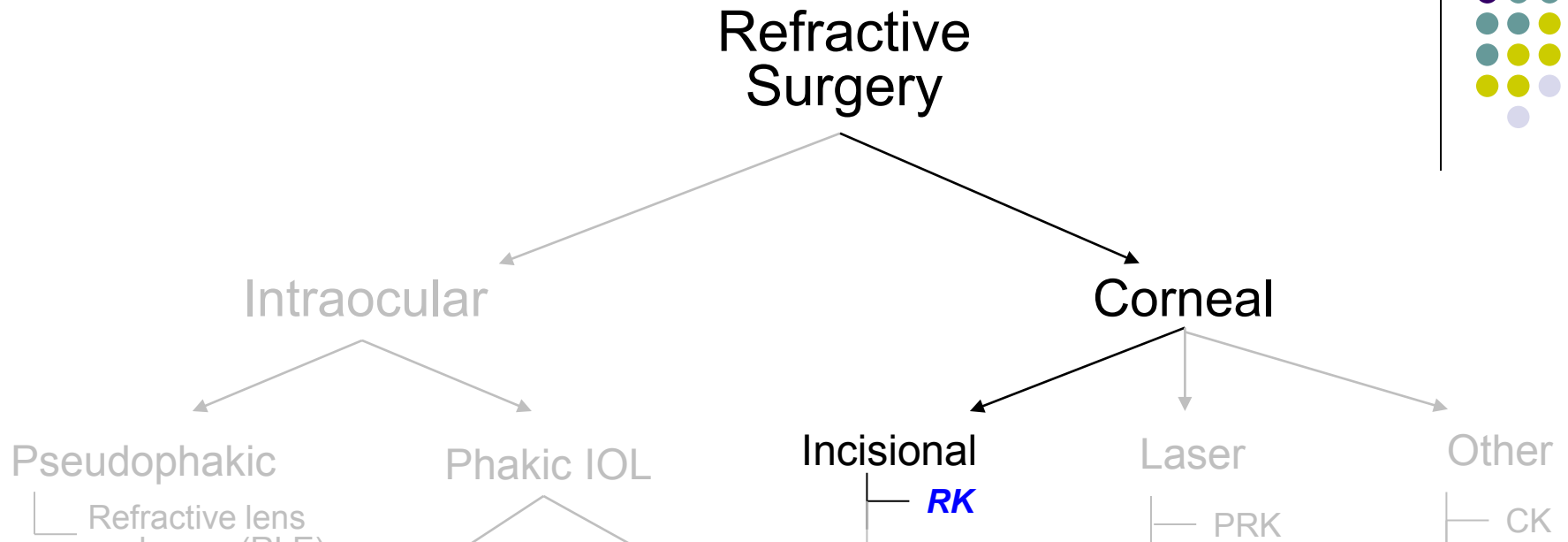
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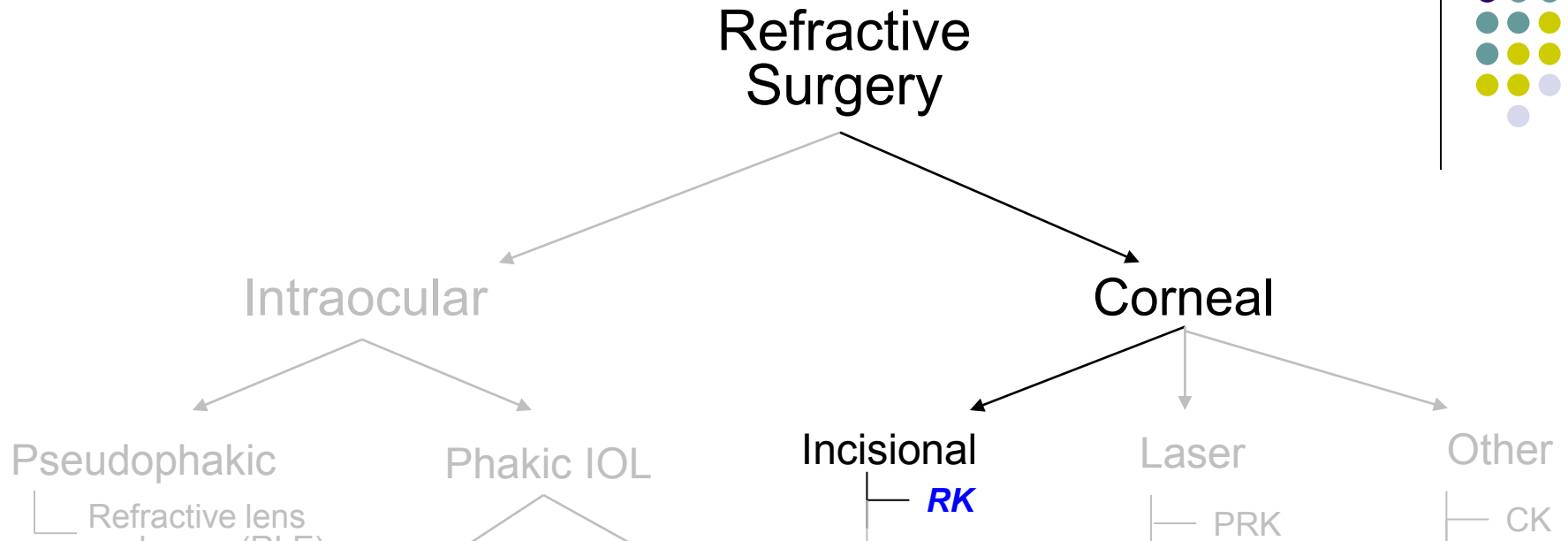
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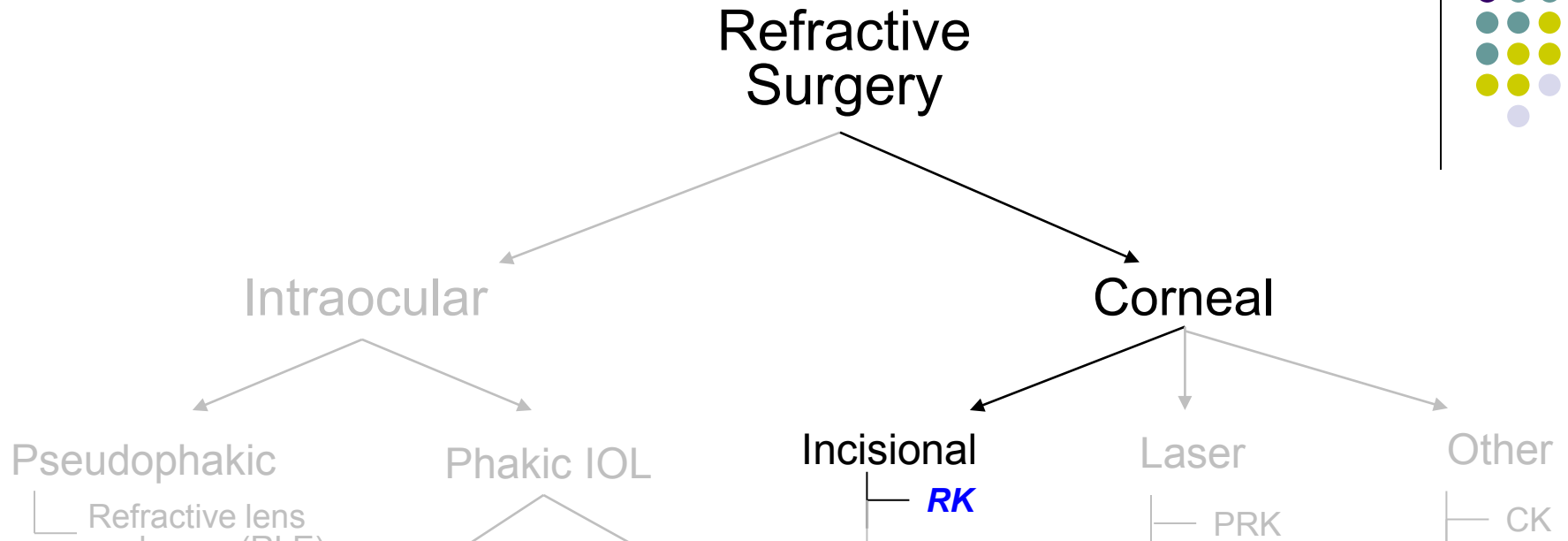
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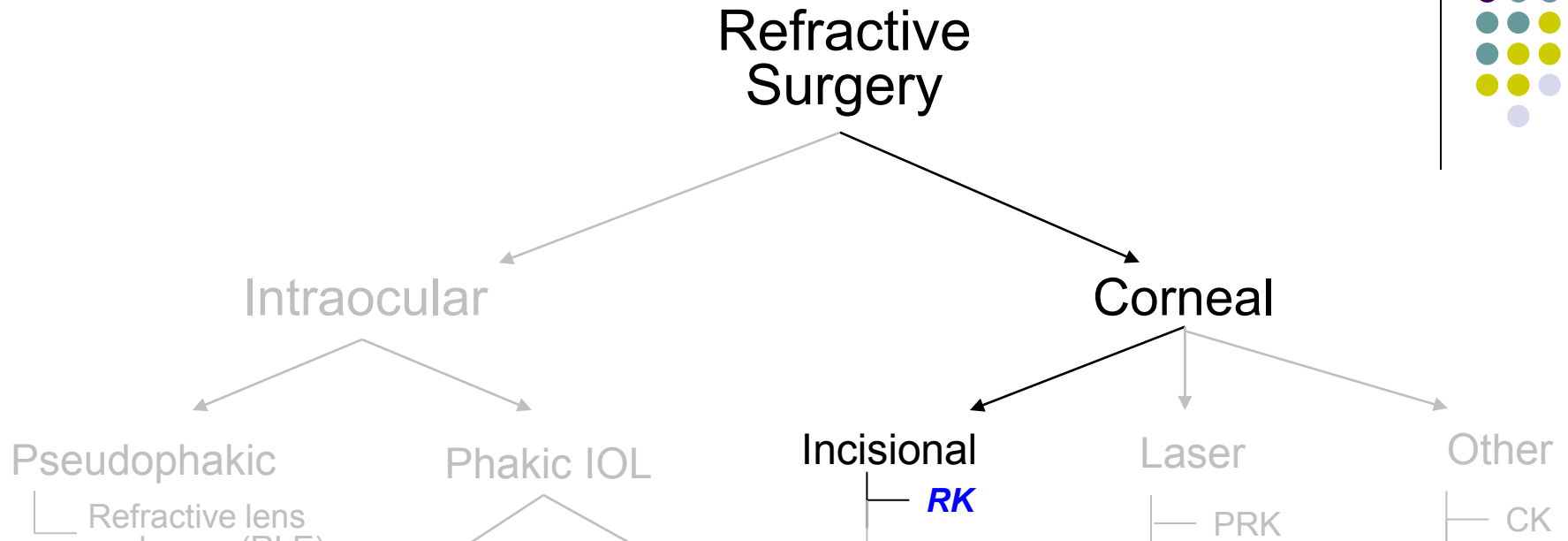
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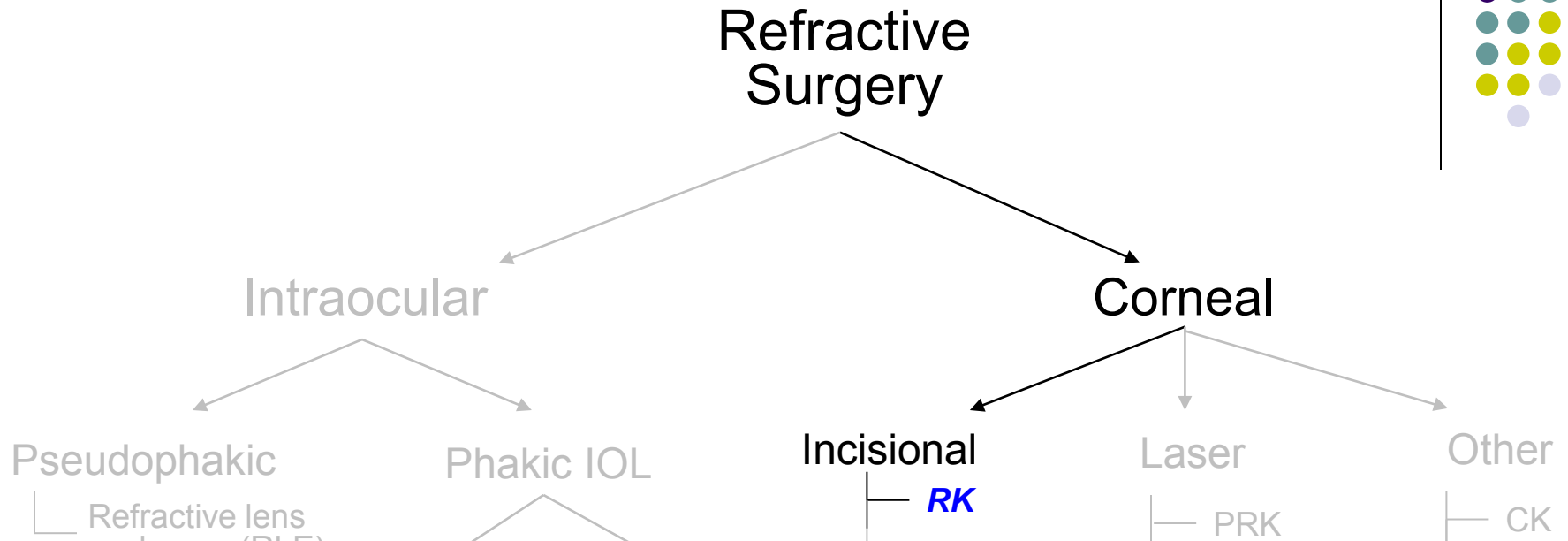
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How does hyperopic drift occur?
Quite common with RK.

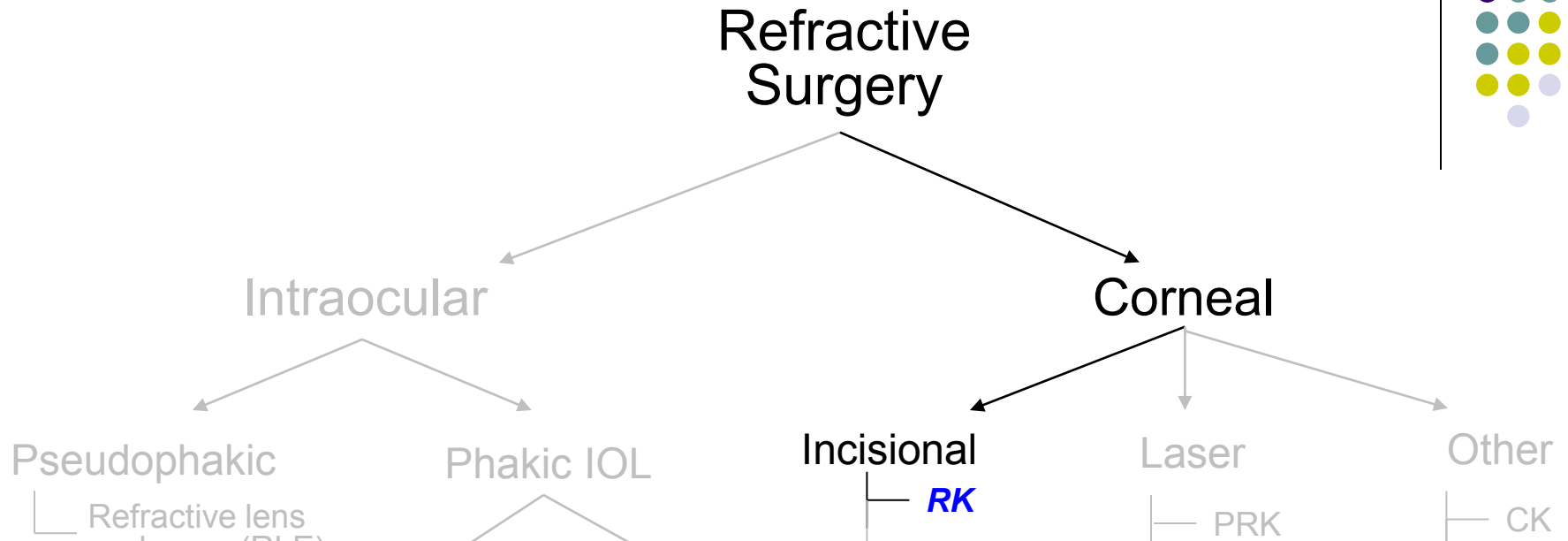
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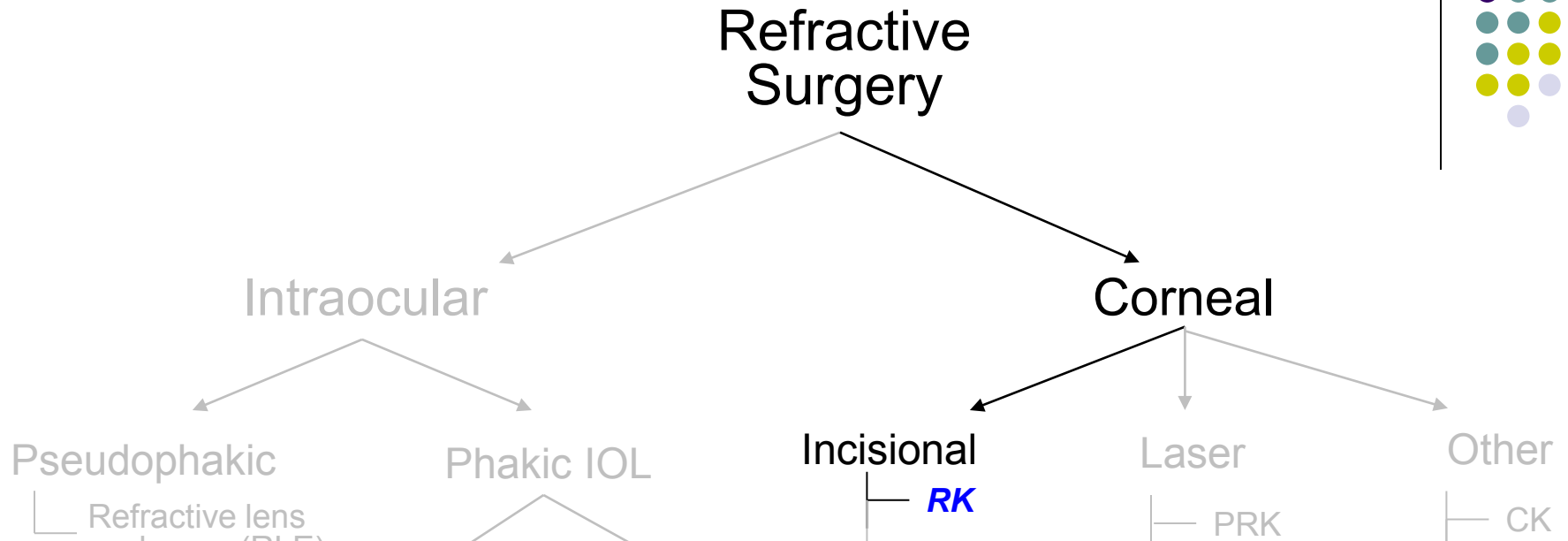
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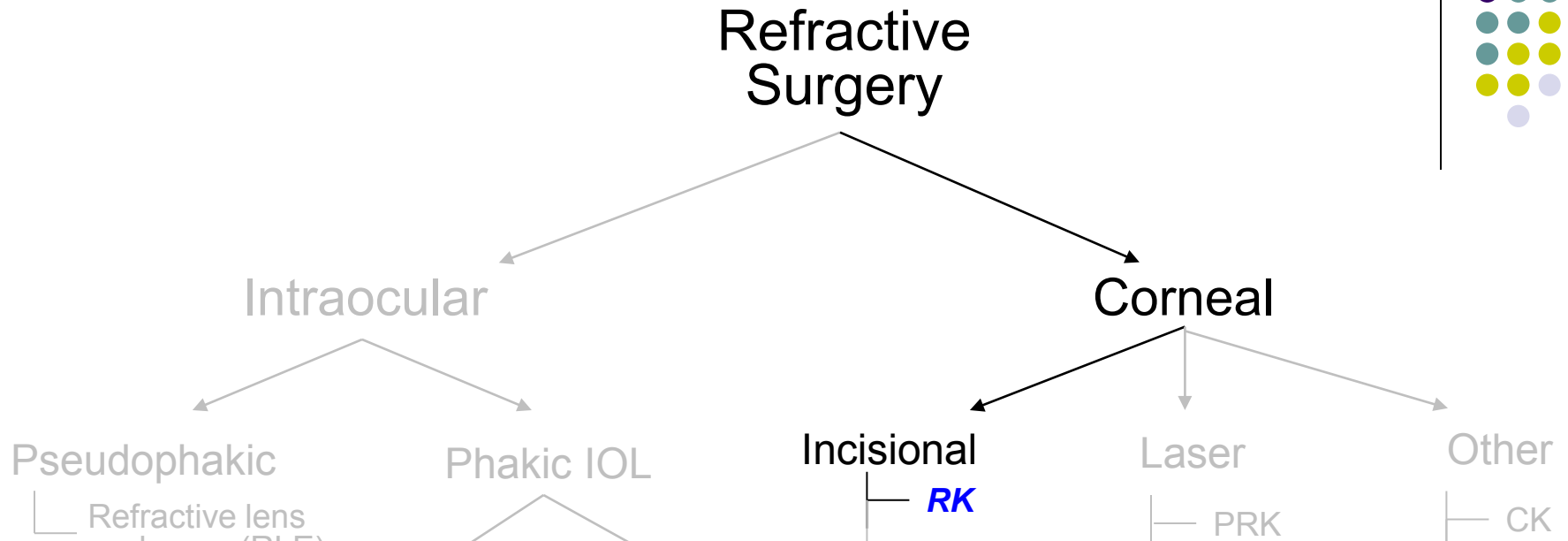
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Yes, they can be treated with a keratoablative laser procedure (eg LASIK; PRK)

Which is preferable in a post-RK eye: a flap-based procedure (eg, LASIK), or a surface-based procedure (eg, PRK)?

While either is acceptable, surface-based procedures are probably preferable, as trying to create a flap in a post-RK cornea can lead to incision-related complications

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First, determine corneal power by either 1) measuring it directly (via a technology capable of doing so in a post-RK eye); 2) using keratometric measurements obtained pre-RK (usually difficult or impossible to obtain); or 3) performing a hard contact-lens overrefraction

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This is discussed in greater depth in the slide-set entitled *IOL Calculations*. But briefly, the problem lies in the way central corneal power is determined. Standard techniques (keratometry; Placido-disc topography) don't measure central power directly; rather, they measure power at about the 3-4 mm optical zone, then **infer** central power based on assumptions concerning the relationship between corneal curvature at these two areas. The trouble is, these assumptions were developed with normal eyes. But after RK, the relationship between peripheral and central power and power at the 3-4 mm zone is altered.

Is there anything that can be done to reduce the likelihood of a hyperopic refractive surprise?

Yes. A number of alternative IOL power calculation techniques have been developed (see the *IOL Calculations* slide-set for details). The short version is as follows:

If standard IOL

Hyperopic

First, determine corneal power by either 1) measuring it directly (via a technology capable of doing so in a post-RK eye); 2) using keratometric measurements obtained pre-RK (usually difficult or impossible to obtain); or 3) performing a hard contact-lens overrefraction; then

Second, performing the calcs via several of the 3rd or 4th generation calc formula, then using the highest vs lowest IOL power that pops out of those calcs

highest vs
lowest

Briefly, how i

Radial incisio

portio

In two v

'Hyperopic drift

How

Quite

How

Usua

How

Over 40!

The radial cuts gape, causing the peripheral cornea to bulge. This **steepens** the peripheral cornea, which in

turn **flattens** the central cornea. Essentially, RK works by redistributing corneal power from the central cornea

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Incisional Corneal Refractive Surgery



Refractive

What is the other main problem associated with RK? (Hint: It's not usually encountered until the pt is 60+ years old.)
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What does this refer to?

To the fact that a significant proportion of RK eyes gradually become more and more hyperopic over time

According to the Prospective Evaluation of Radial Keratotomy (PERK) study, what percentage of RK eyes will manifest a diopter or more of hyperopic drift after 10 years?

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Incisional Corneal Refractive Surgery



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If standard IOL

Hyperopic

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With regard to the IOL itself, can a toric and/or a multifocal lens be used in a post RK eye?

Second, performing the calcs via several of the 3rd or 4th generation calc formula, then using the **highest** IOL power that pops out of those calcs

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Incisional Corneal Refractive Surgery



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With regard to the IOL itself, can a toric and/or a multifocal lens be used in a post RK eye?

A **one** can be considered, but **the other** should be avoided in these eyes

Second, performing the calcs via several of the 3rd or 4th generation calc formula, then using the **highest** IOL power that pops out of those calcs

'Hyperopic drift'

What does this refer to?

To the fact that a significant proportion of RK eyes gradually become more and more hyperopic over time

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Incisional Corneal Refractive Surgery



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A toric lens can be considered, but multifocals should be avoided in these eyes

Second, performing the calcs via several of the 3rd or 4th generation calc formula, then using the **highest** IOL power that pops out of those calcs

What does this refer to?

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Incisional Corneal Refractive Surgery



Refractive

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Why does RK lead to imprecise IOL calcs?

This is discussed in greater depth in the slide-set entitled *IOL Calculations*. But briefly, the problem lies in the way central corneal curvature is measured. RK changes the curvature of the cornea, and this change is not uniform. *What about the cataract surgery itself--are there any adjustments in technique that should be considered?*

If standard keratometry is applied to the RK eye, the resulting refractive error is hyperopic.
Hyperopic

Briefly, how is RK performed?

Radial incisions are made that extend from the peripheral cornea to the edge of the 'optical zone' (central portion of the cornea). ^{other}

In two words, what is the ^{other} main long-term problem with RK?
'Hyperopic drift'

How does this happen?
Quite simply

What does this refer to?
To the fact that a significant proportion of RK eyes gradually become more and more hyperopic over time

How much hyperopia?
Usually

According to the Prospective Evaluation of Radial Keratotomy (PERK) study, what percentage of RK eyes will manifest a diopter or more of hyperopic drift after 10 years?

How much?
Over 40!

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Incisional Corneal Refractive Surgery



Refractive

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This is discussed in greater depth in the slide-set entitled *IOL Calculations*. But briefly, the problem lies in the way central corneal curvature is measured. RK changes the curvature of the central cornea, which leads to imprecise IOL calculations.

What about the cataract surgery itself--are there any adjustments in technique that should be considered?

Yes. The surgeon should give consideration to employing a **two-words** incision, in order to avoid 'crossing' the RK incisions.

If someone has RK and is having cataract surgery, what should the surgeon be aware of?
Hyperopic

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What about the cataract surgery itself--are there any adjustments in technique that should be considered?
Yes. The surgeon should give consideration to employing a scleral-tunnel incision, in order to avoid 'crossing' the RK incisions.

If someone has RK and then develops cataracts, what should be considered?
Hyperopic

Briefly, how is RK performed?

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What about the cataract surgery itself--are there any adjustments in technique that should be considered?

Yes. The surgeon should give consideration to employing a scleral-tunnel incision, in order to avoid 'crossing' the RK incisions.

If the RK cornea possesses significant astigmatism, where should the cataract incision be placed?

If significant astigmatism is present, the incision should be placed perpendicular to the astigmatic axis.
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dev
pov

If the RK cornea possesses significant astigmatism, where should the cataract incision be placed?

If feasible, on the flat vs steep meridian

If st Hyperopic

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Incisional Corneal Refractive Surgery



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Because of these and other issues, RK is considered 'obsolete,' and thus is no longer performed in the US

If standard IOL calc techniques are applied to an RK eye, will the resulting 'refractive surprise' be myopic, or hyperopic?
Hyperopic

Briefly, in two words, what is the main short term problem with RK?

'Diurnal fluctuation'

In two words, what is the main long-term problem with RK?

'Hyperopic drift'

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According to the Prospective Evaluation of Radial Keratotomy (PERK) study, what percentage of RK eyes will manifest a diopter or more of hyperopic drift after 10 years?

Over 40!

The radial keratotomy procedure involves making incisions in the cornea, resulting in more hyperopia. After several hours of increased O₂ exposure while the eyes are open, the edema dissipates, and the excess hyperopia resolves. The hyperopia is primarily in the peripheral cornea.

Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

There is another procedure, similar to AK and LRI, that was at one time commonly used to correct astigmatism, but is rarely used today. What is it?

Corneal

Incisional

RK

AK

LRI

?

Laser

PRK

LASEK

Epi-LASIK

LASIK

SMILE

Other

CK

SAI

CRI

CXL

ICRS

Incisional Corneal Refractive Surgery



Refractive Surgery

Intraocular

Pseudophakic

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There is another procedure, similar to AK and LRI, that was at one time commonly used to correct astigmatism, but is rarely used today. What is it?

Transverse keratotomy

(Note: 'Transverse keratotomy' is aka tangential keratotomy)

Corneal

Incisional

RK

AK

LRI

Transverse keratotomy

Laser

PRK

LASEK

Epi-LASIK

LASIK

SMILE

Other

CK

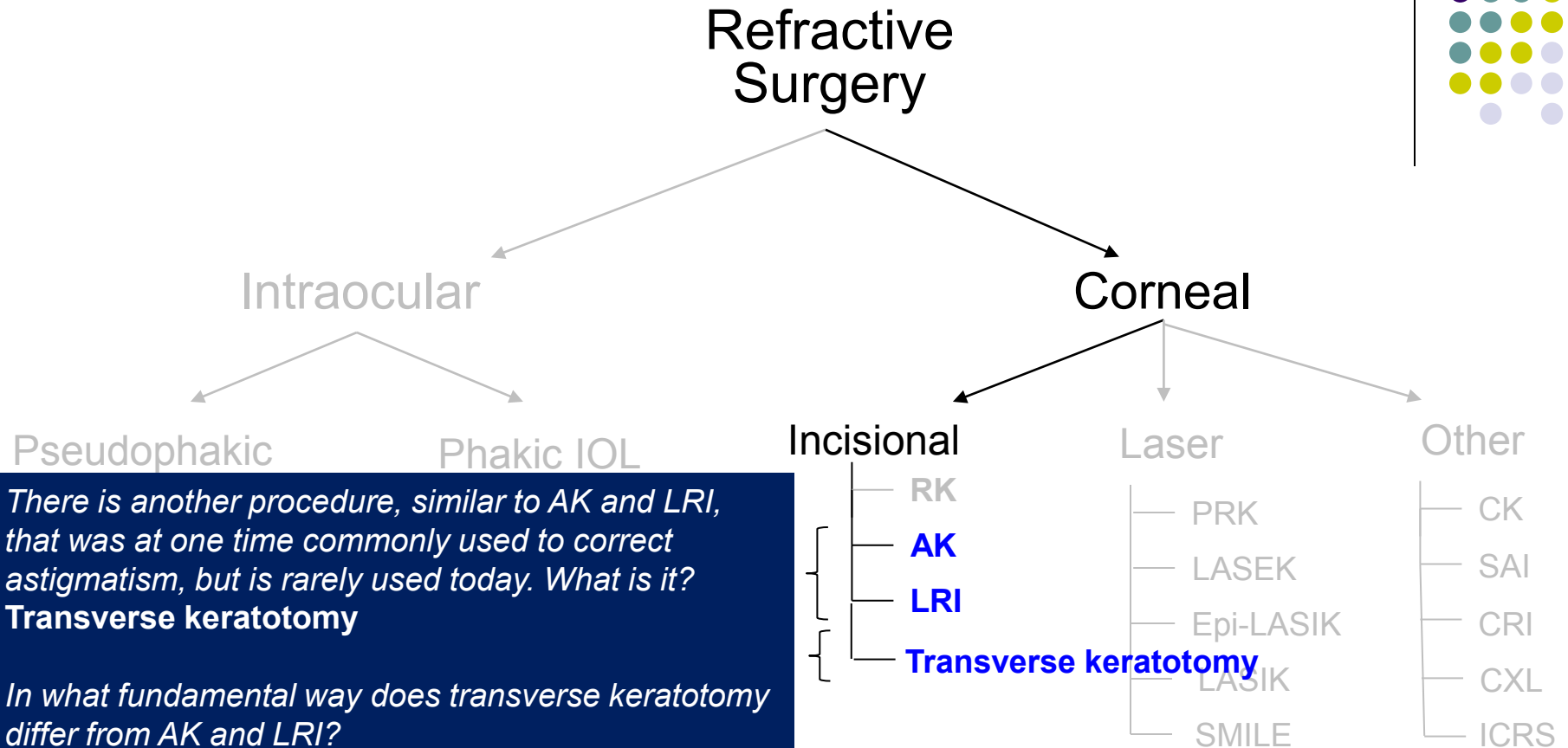
SAI

CRI

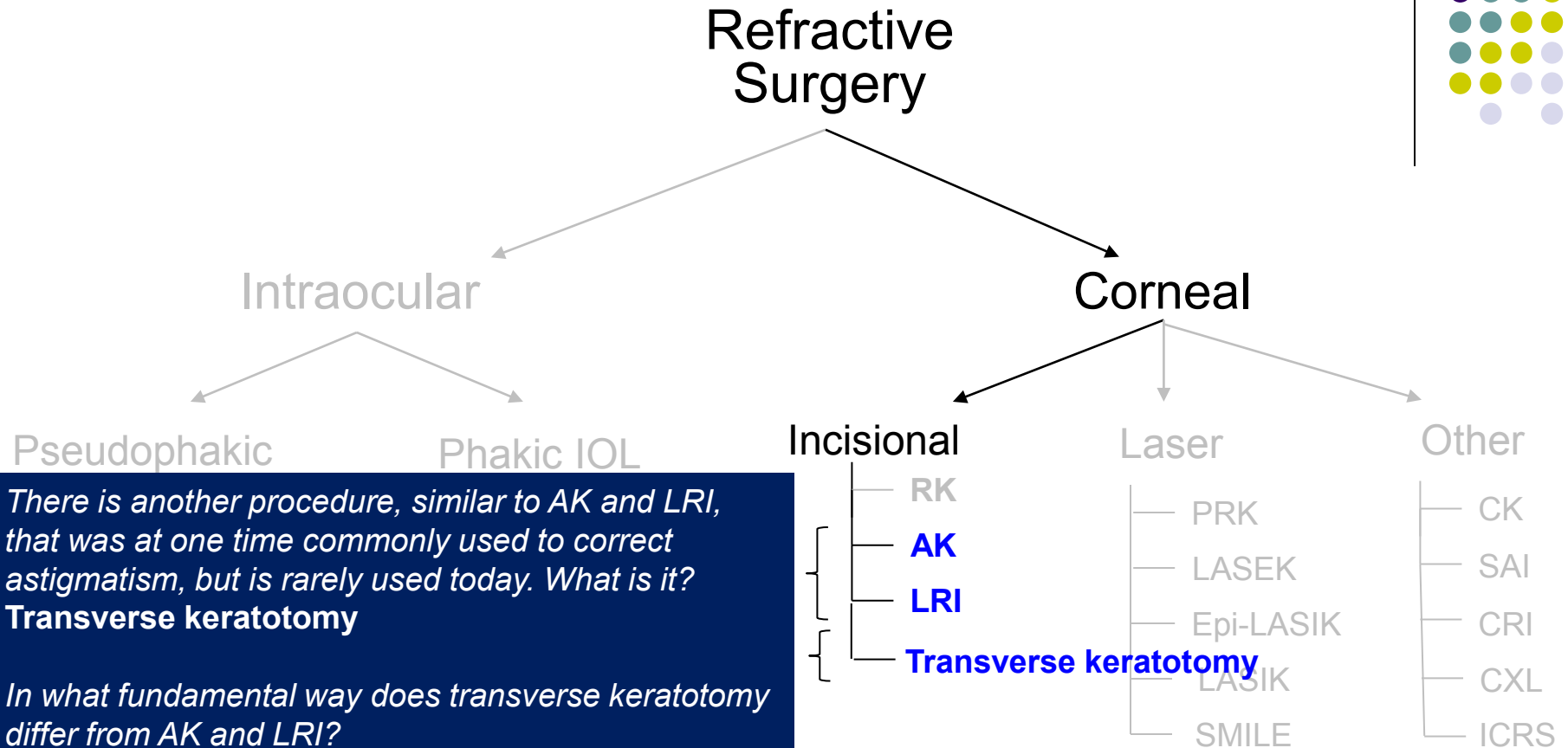
CXL

ICRS

Incisional Corneal Refractive Surgery



Incisional Corneal Refractive Surgery



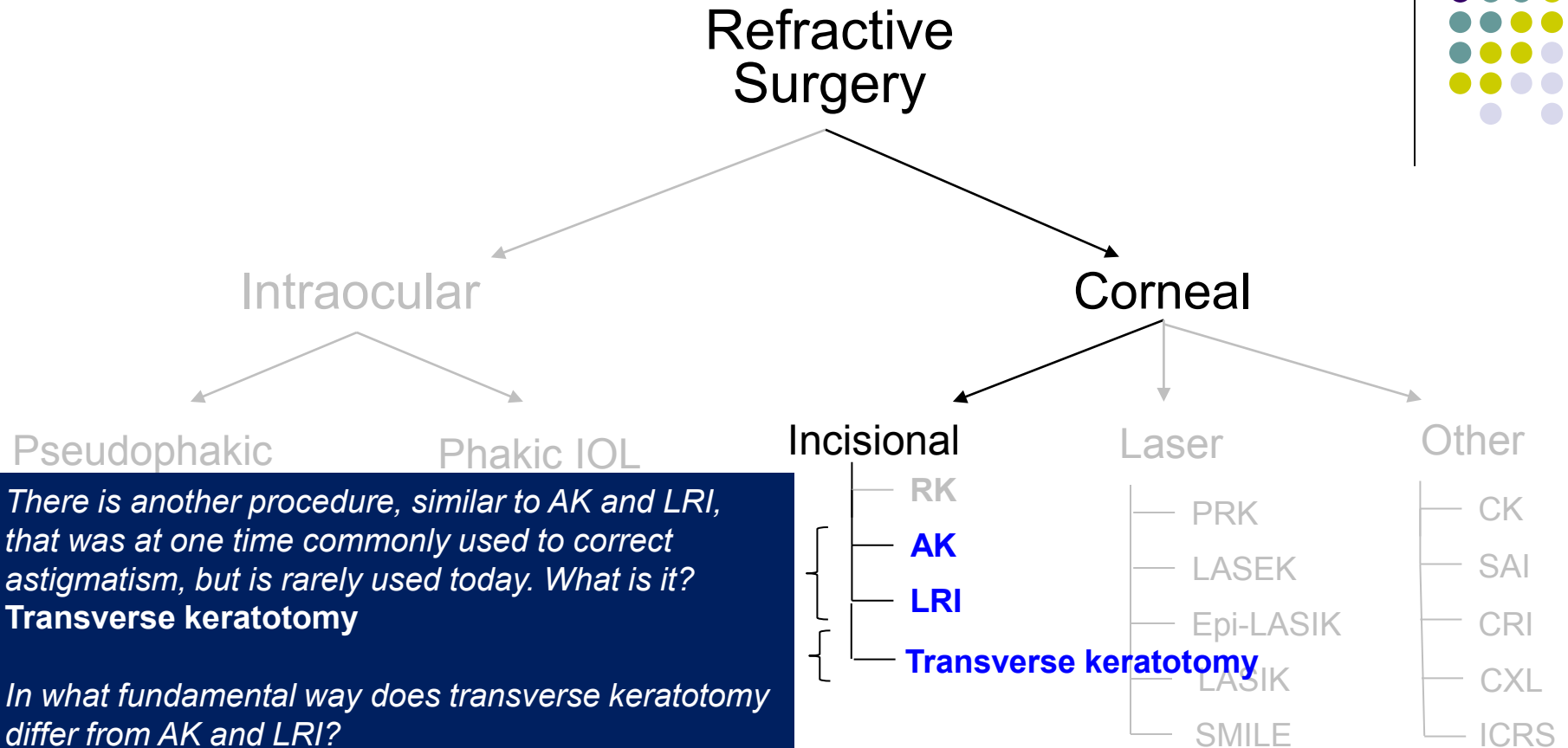
There is another procedure, similar to AK and LRI, that was at one time commonly used to correct astigmatism, but is rarely used today. What is it?

Transverse keratotomy

In what fundamental way does transverse keratotomy differ from AK and LRI?

In terms of the shape of the incision--AK/LRI incisions are whereas transverse keratotomy incisions are

Incisional Corneal Refractive Surgery



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Transverse keratotomy

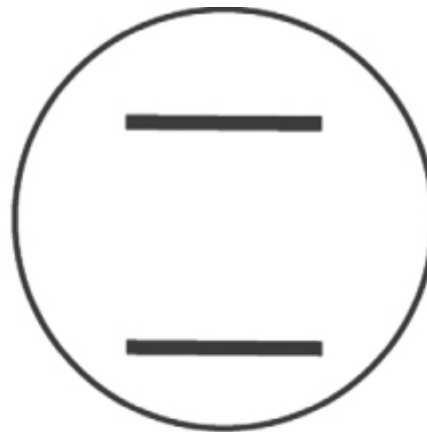
In what fundamental way does transverse keratotomy differ from AK and LRI?

In terms of the shape of the incision--AK/LRI incisions are **curved**, whereas transverse keratotomy incisions are **straight**

Incisional Corneal Refractive Surgery



Arcuate



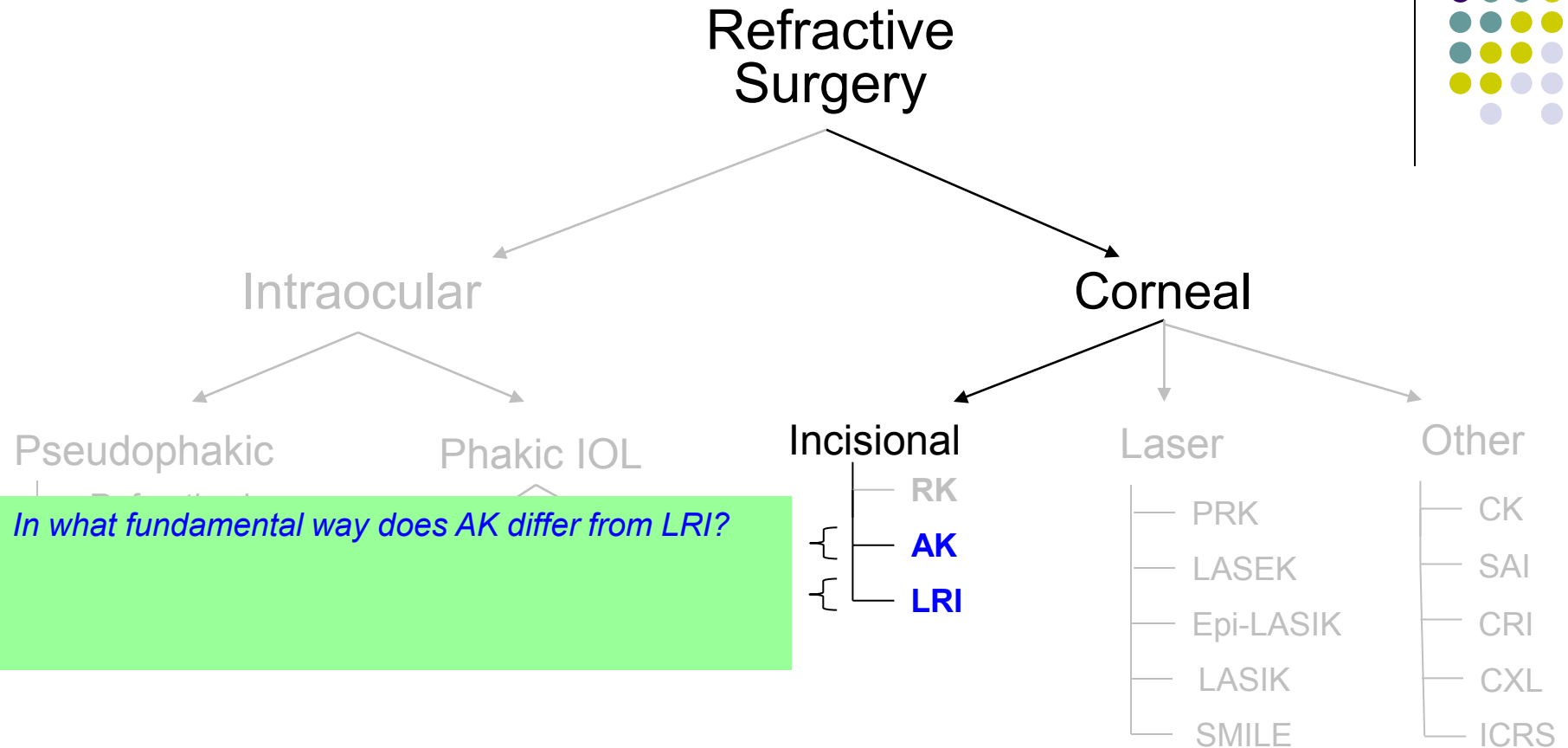
Tangential



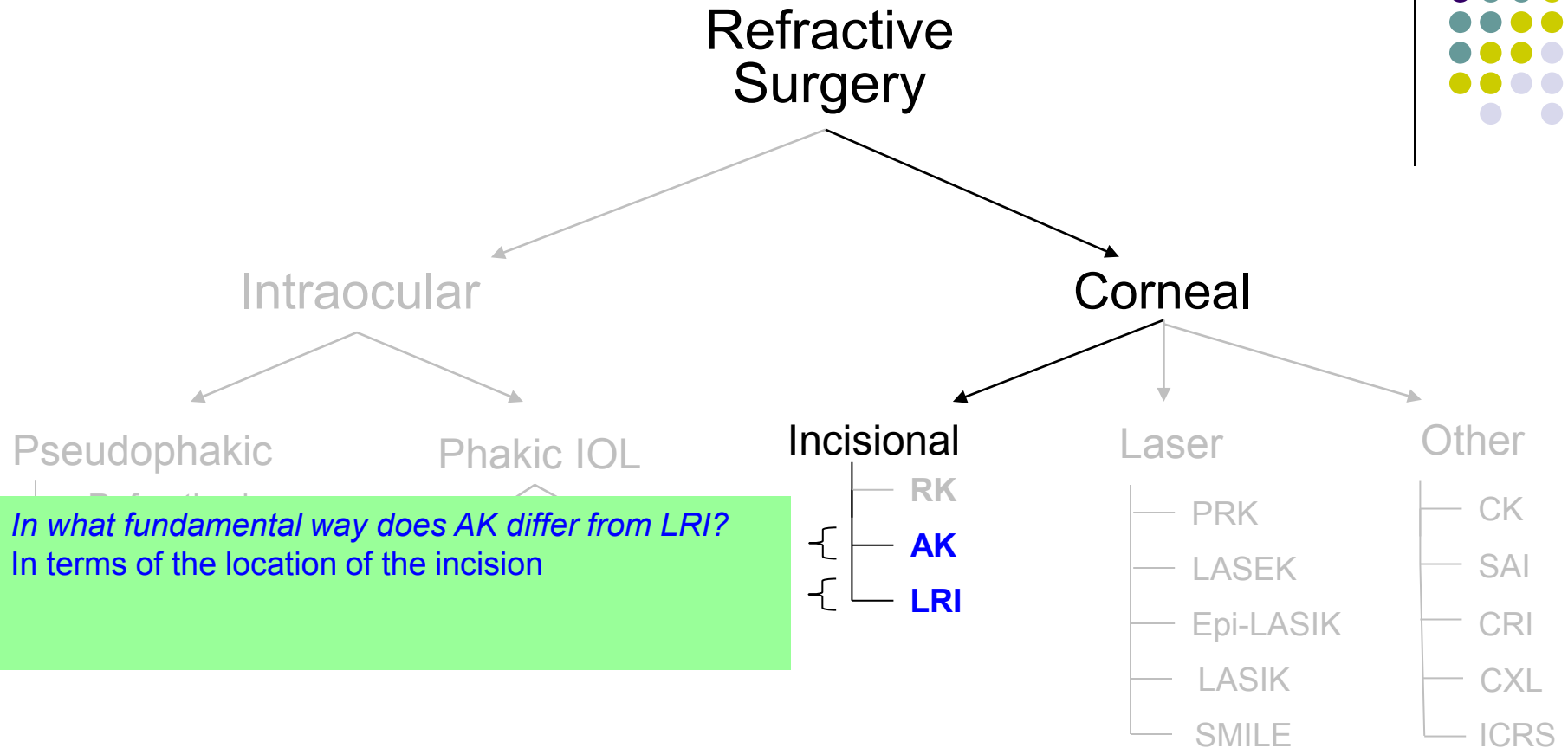
Limbal relaxing
incisions

Schematic diagrams of incisions used in astigmatic keratotomy. Flattening is induced in the axis of the incisions (at 90° in this case), and steepening is induced 90° away from the incisions (at 180° in this case).

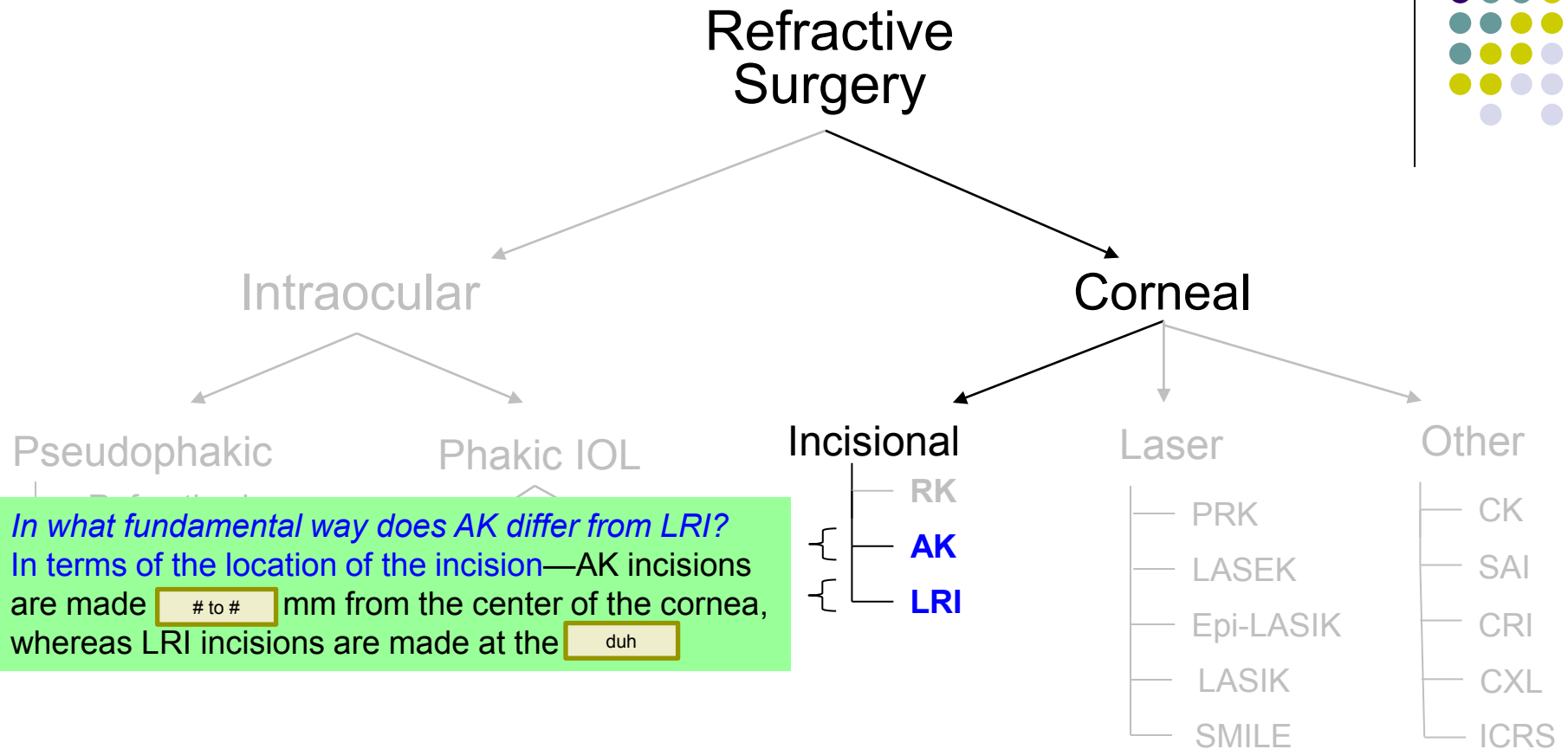
Incisional Corneal Refractive Surgery



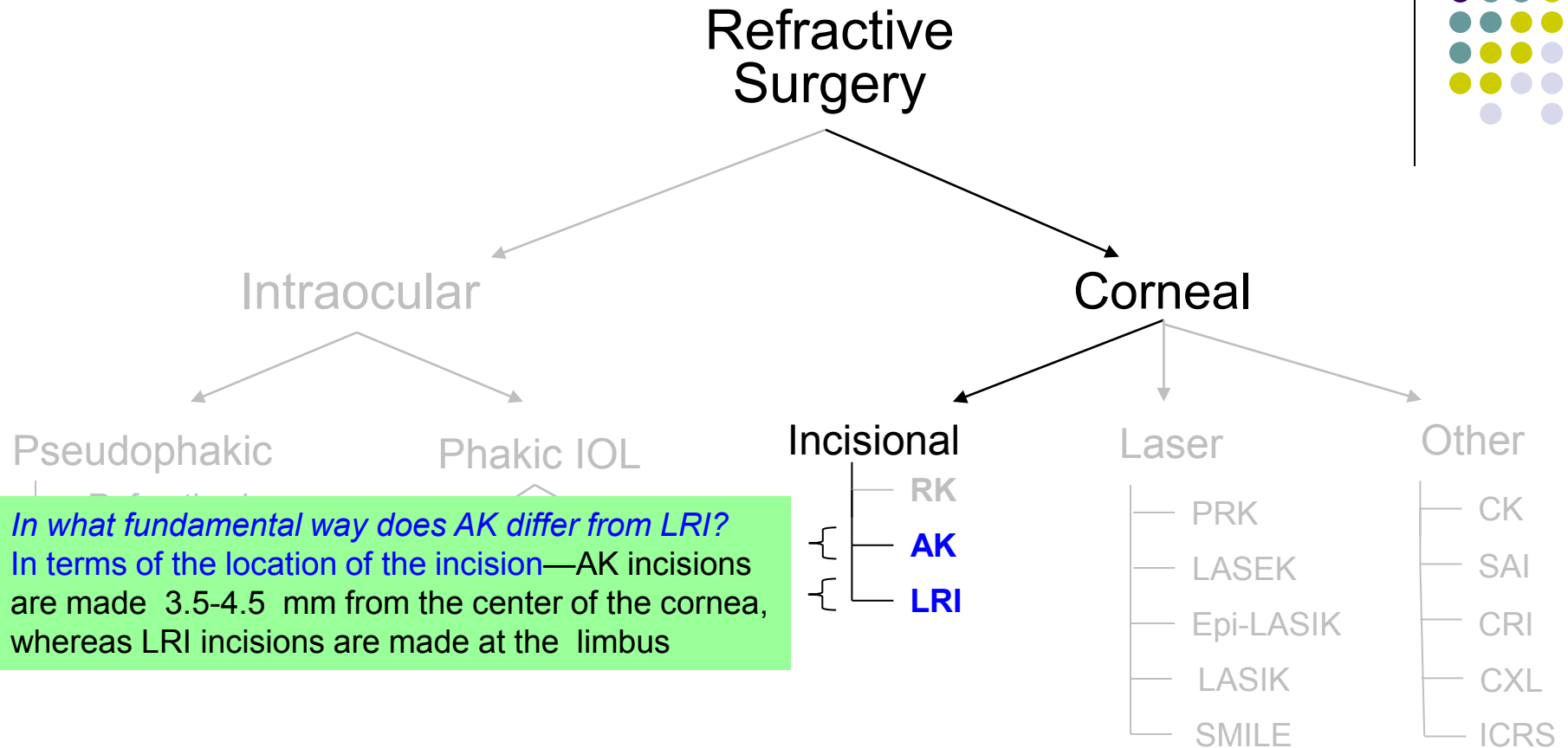
Incisional Corneal Refractive Surgery



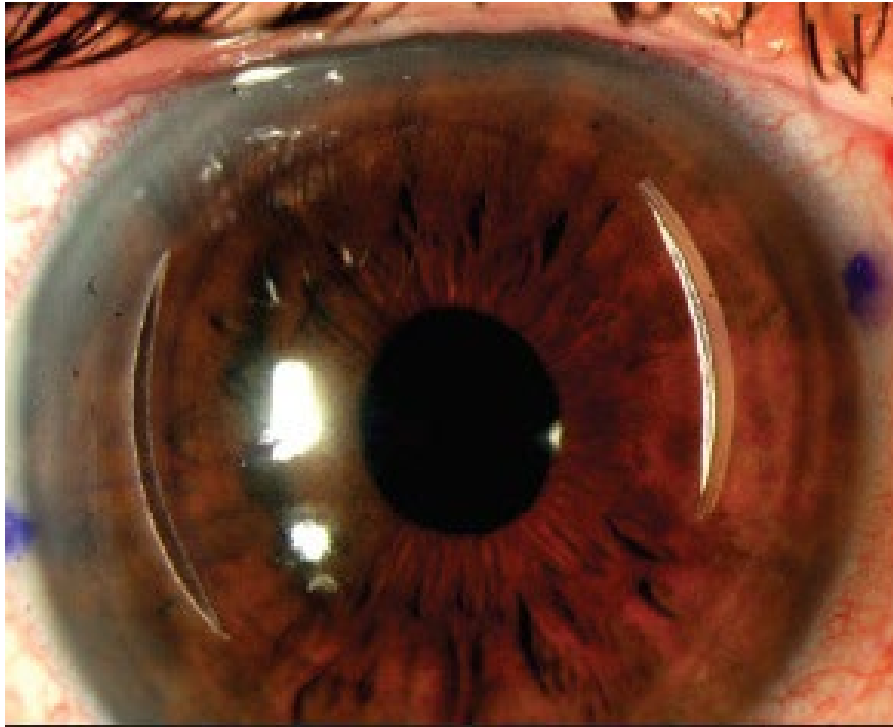
Incisional Corneal Refractive Surgery



Incisional Corneal Refractive Surgery

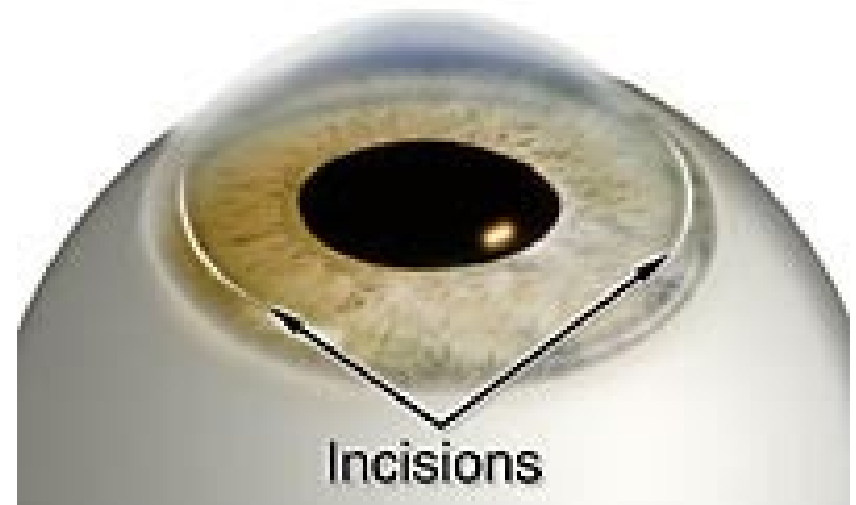


Incisional Corneal Refractive Surgery



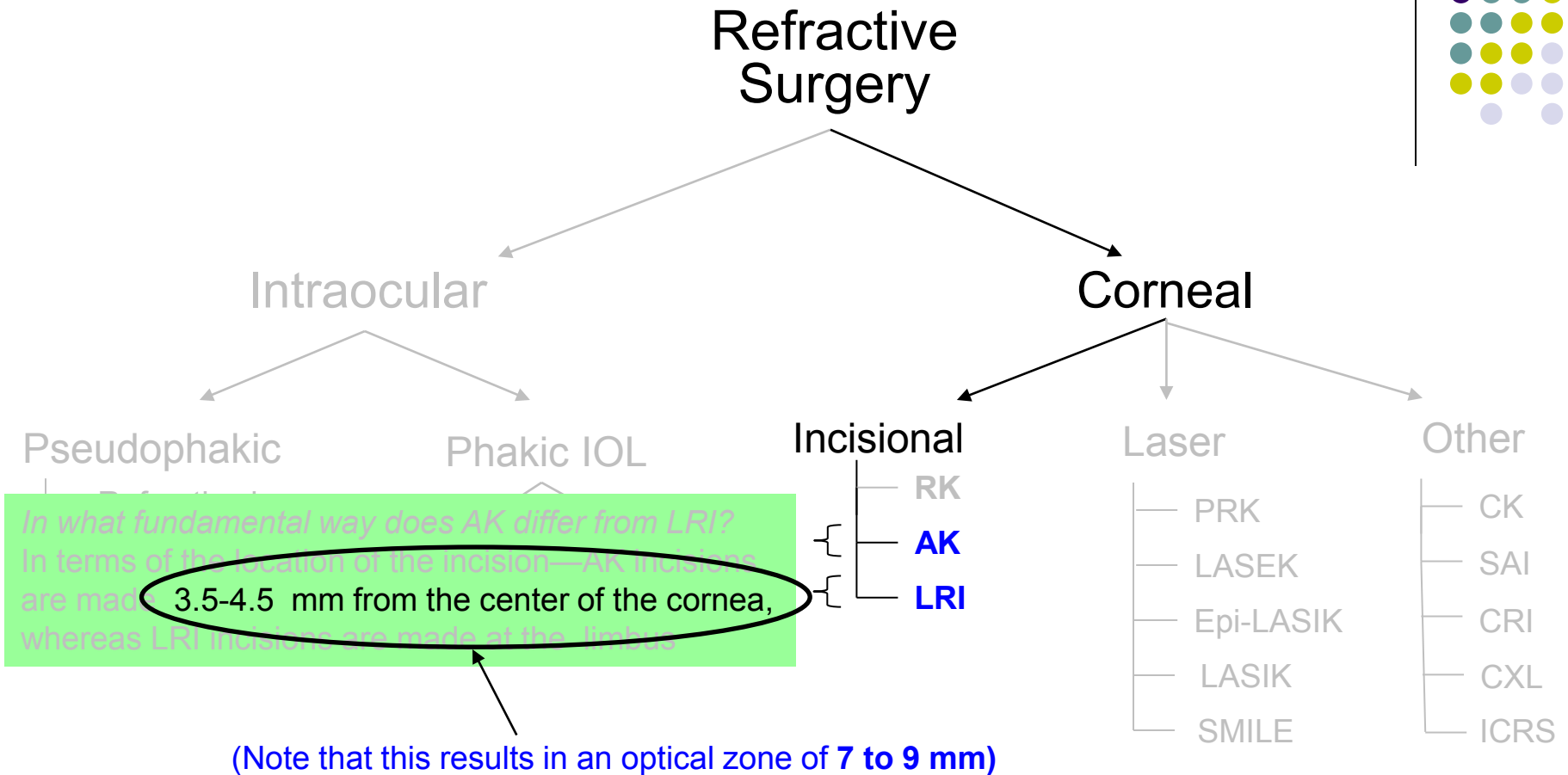
AK incisions

Limbal Relaxing Incisions



LR incisions

Incisional Corneal Refractive Surgery



Incisional Corneal Refractive Surgery



Refractive Surgery

Corneal

Incisional

RK

AK

LRI

Laser

PRK

LASEK

Epi-LASIK

LASIK

SMILE

Other

CK

SAI

CRI

CXL

ICRS

Are AK and LRI incisions placed on the steep, or the flat meridian of the cornea?

Incisional Corneal Refractive Surgery



Refractive Surgery

Corneal

Incisional

RK

AK

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The steep

Incisional Corneal Refractive Surgery



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CK

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Are AK and LRI incisions placed on the steep, or the flat meridian of the cornea?

The steep

Are they performed singularly, or in pairs?

Incisional Corneal Refractive Surgery



Refractive Surgery

Corneal

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RK

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LASIK

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Other

CK

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Are AK and LRI incisions placed on the steep, or the flat meridian of the cornea?

The steep

Are they performed singularly, or in pairs?

Usually pairs, on opposite sides of the cornea

Incisional Corneal Refractive Surgery



Refractive Surgery

Corneal

Incisional

RK

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ICRS

Are AK and LRI incisions placed on the steep, or the flat meridian of the cornea?

The steep

Are they performed singularly, or in pairs?

Usually pairs, on opposite sides of the cornea

Which is more commonly used today?

Incisional Corneal Refractive Surgery



Refractive Surgery

Corneal

Incisional

RK

AK

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Are AK and LRI incisions placed on the steep, or the flat meridian of the cornea?

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Are they performed singularly, or in pairs?

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Which is more commonly used today?

LRIs, by a mile

Incisional Corneal Refractive Surgery



Refractive Surgery

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LRIs, by a mile

What is the typical context in which LRIs are used?

Incisional Corneal Refractive Surgery



Refractive Surgery

Corneal

Incisional

RK

AK

LRI

Laser

PRK

LASEK

Epi-LASIK

LASIK

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SAI

CRI

CXL

ICRS

Are AK and LRI incisions placed on the steep, or the flat meridian of the cornea?

The steep

Are they performed singularly, or in pairs?

Usually pairs, on opposite sides of the cornea

Which is more commonly used today?

LRIs, by a mile

What is the typical context in which LRIs are used?

They are usually performed at the time of cataract surgery, or shortly thereafter

Incisional Corneal Refractive Surgery



Refractive Surgery

Corneal

Incisional

RK

AK

LRI

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PRK

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SMILE

Other

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astigmatism

common eye surgery

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Either in the **host vs donor** cornea, or the PK incision itself

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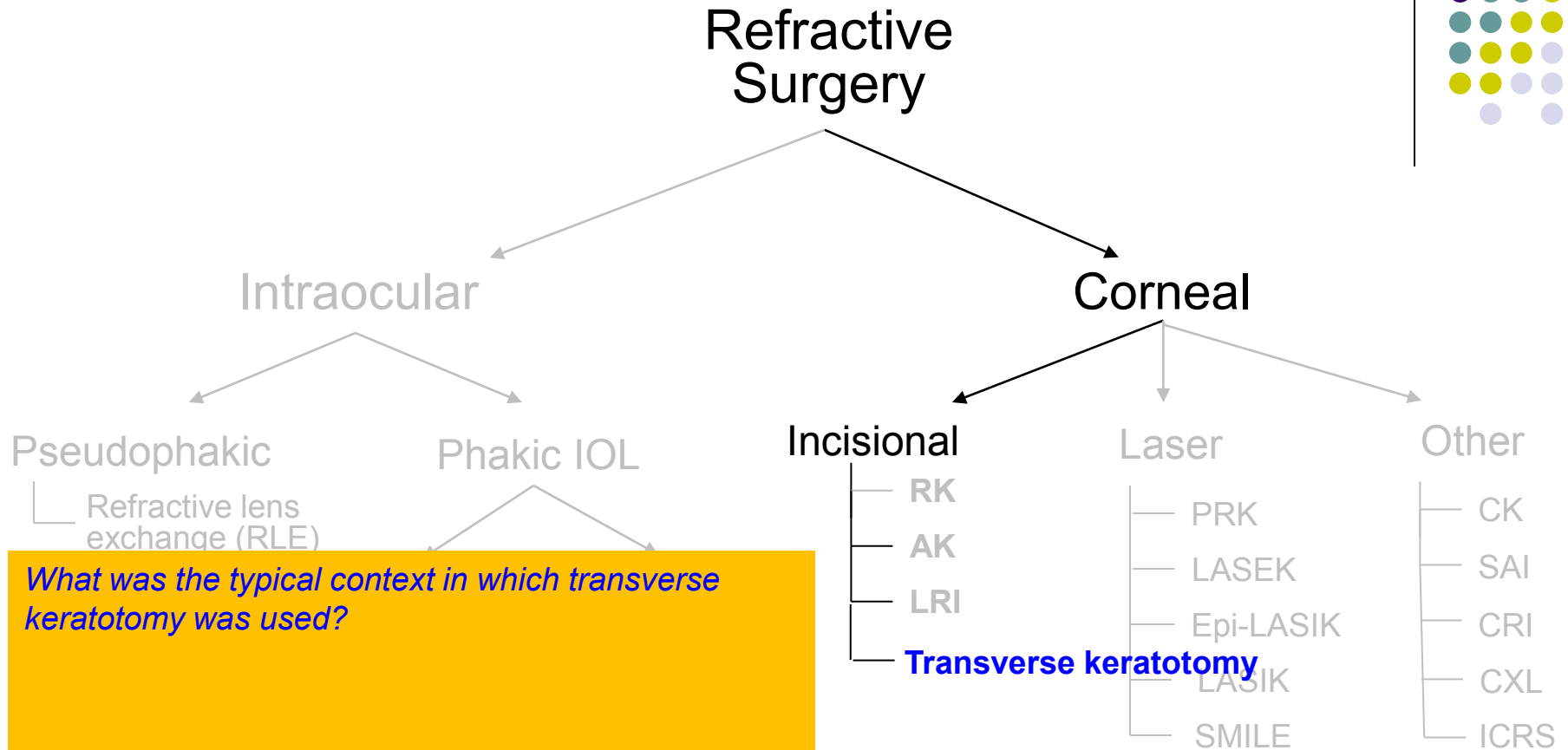
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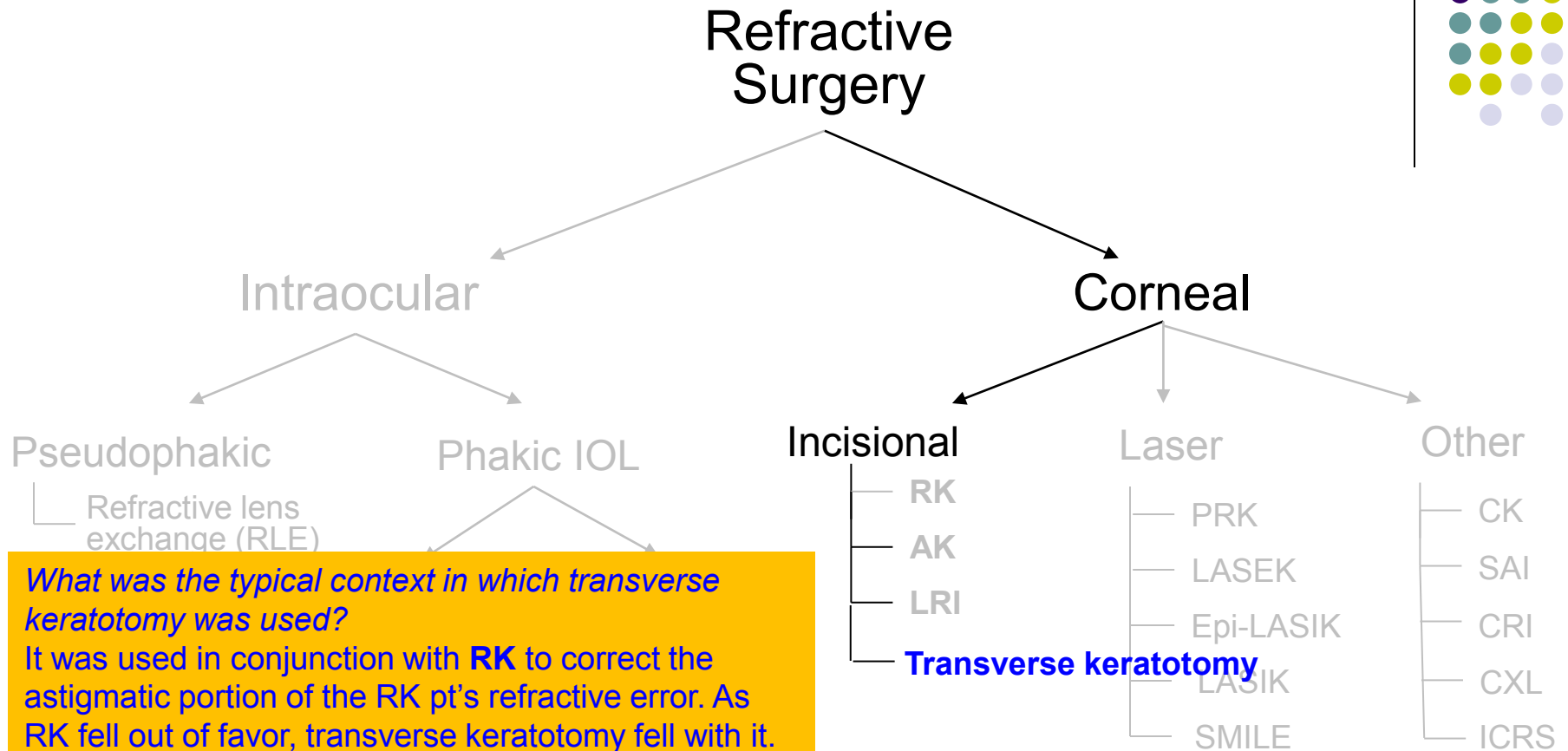
Because doing so produces only a negligible effect on the astigmatism

Incisional Corneal Refractive Surgery



What was the typical context in which transverse keratotomy was used?

Incisional Corneal Refractive Surgery

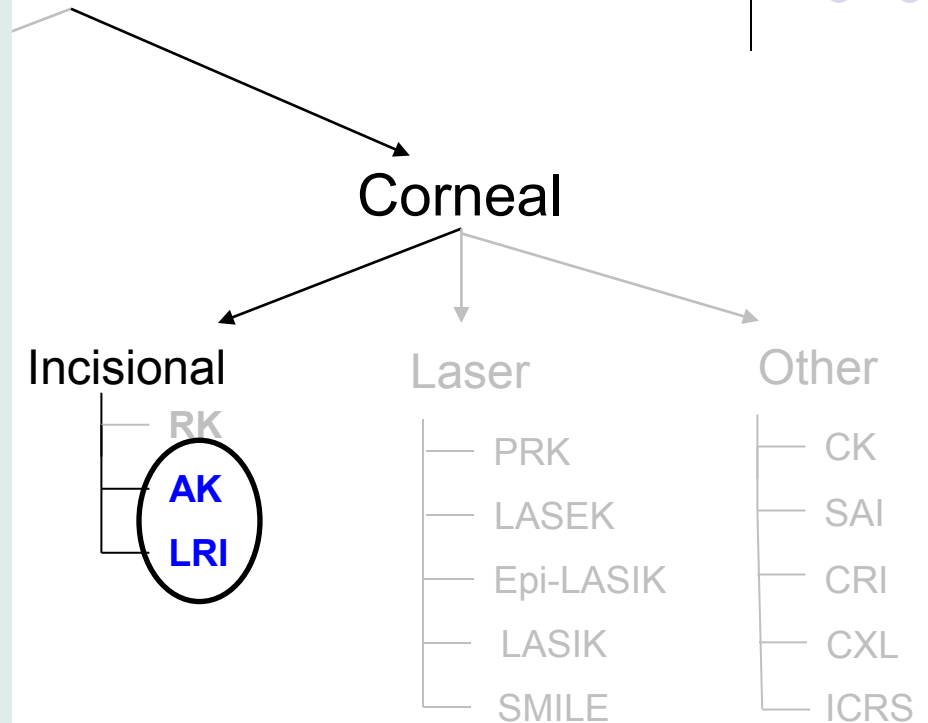


Incisional Corneal Refractive Surgery



When AK and LRI incisions placed on the steep meridian of the cornea, what effect do they have on that meridian's steepness?

Refractive Surgery



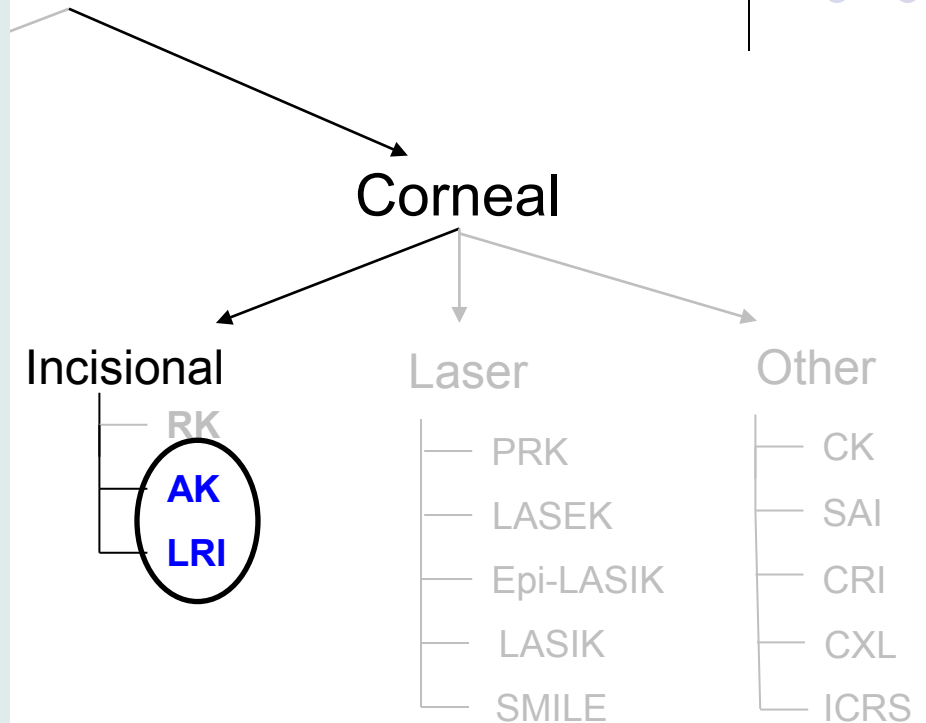
Incisional Corneal Refractive Surgery



When AK and LRI incisions placed on the steep meridian of the cornea, what effect do they have on that meridian's steepness?

They **flatten** it

Refractive Surgery



Incisional Corneal Refractive Surgery

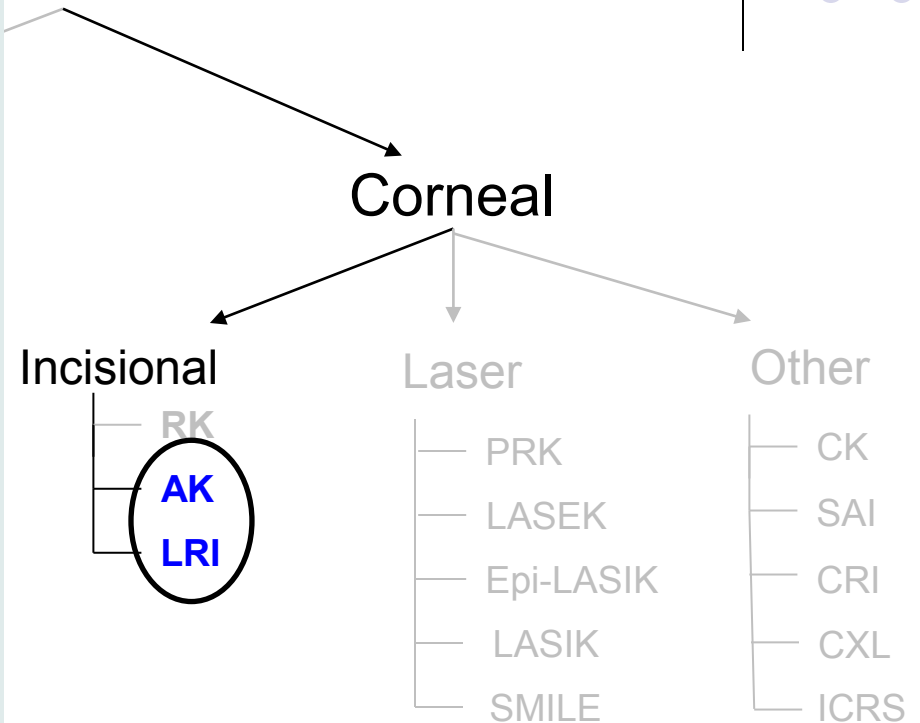


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Refractive Surgery



Incisional Corneal Refractive Surgery



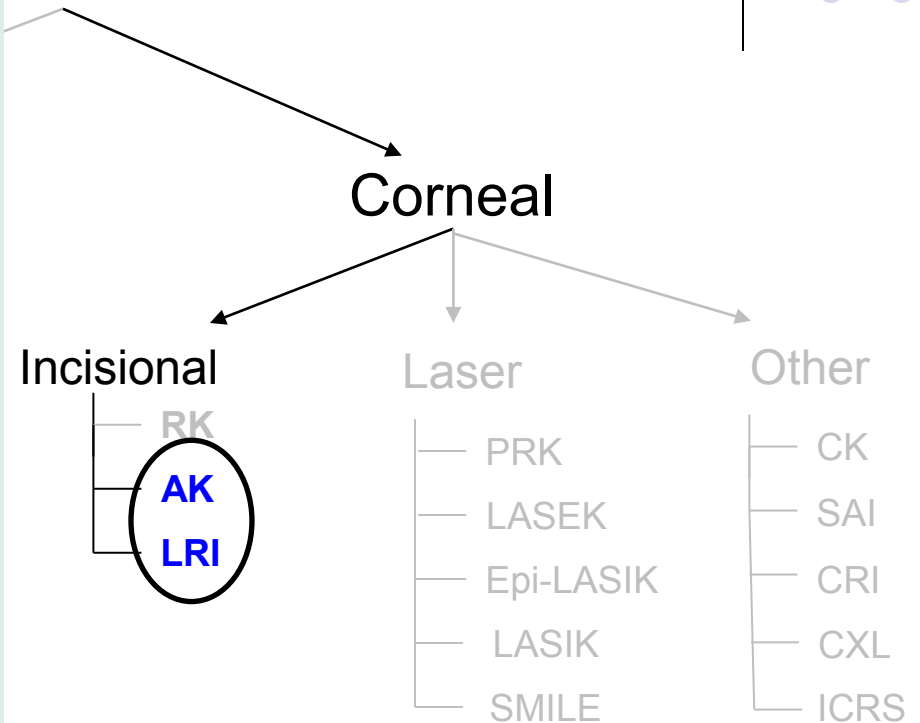
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Refractive Surgery



Incisional Corneal Refractive Surgery



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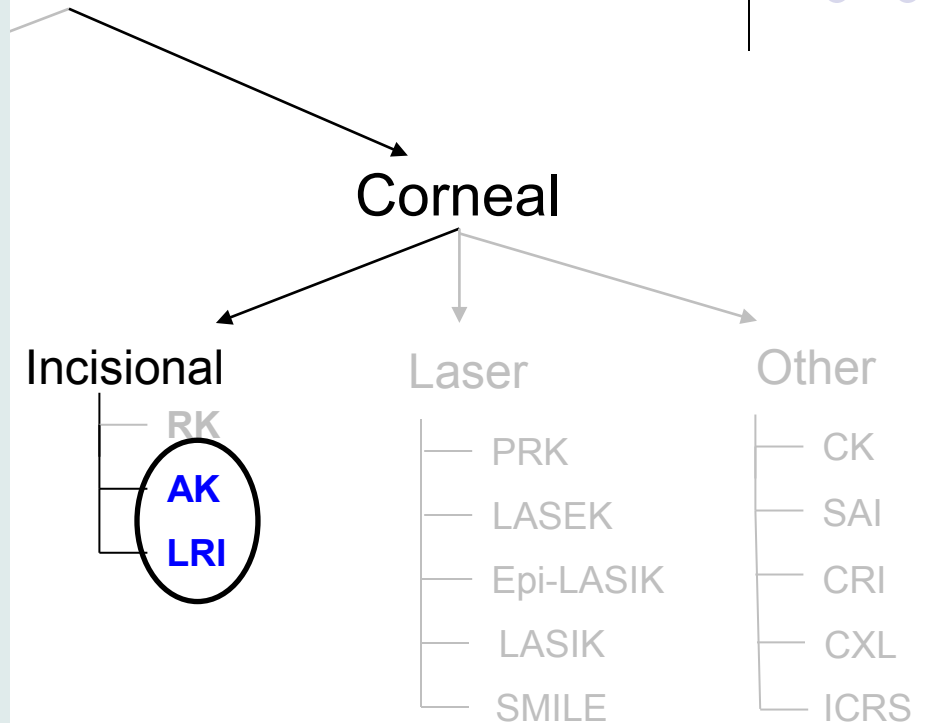
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Refractive Surgery



Incisional Corneal Refractive Surgery



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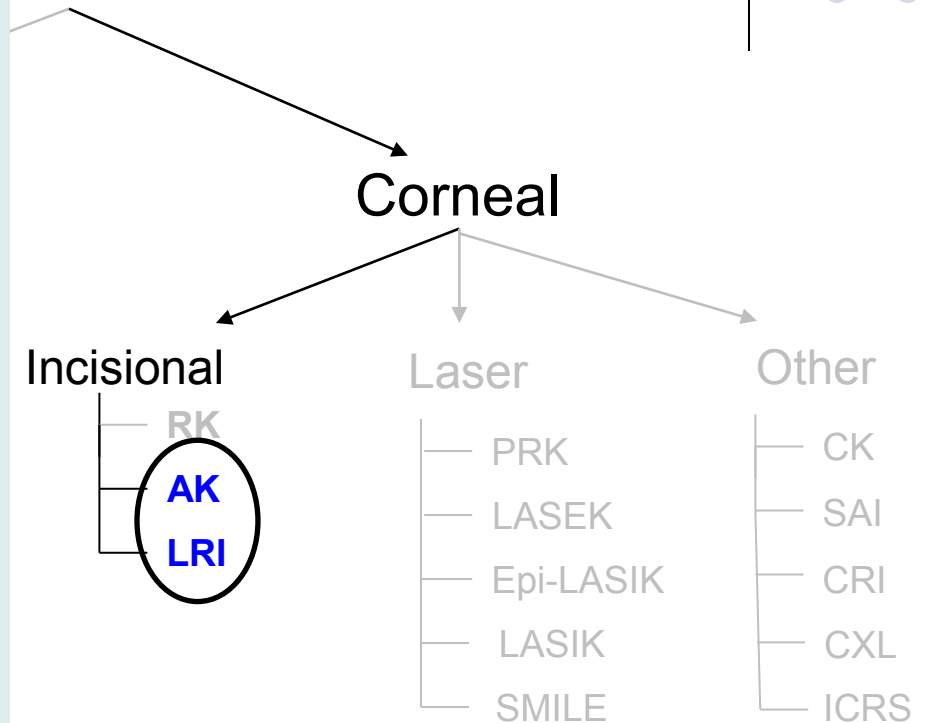
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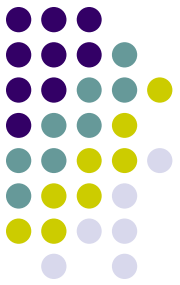
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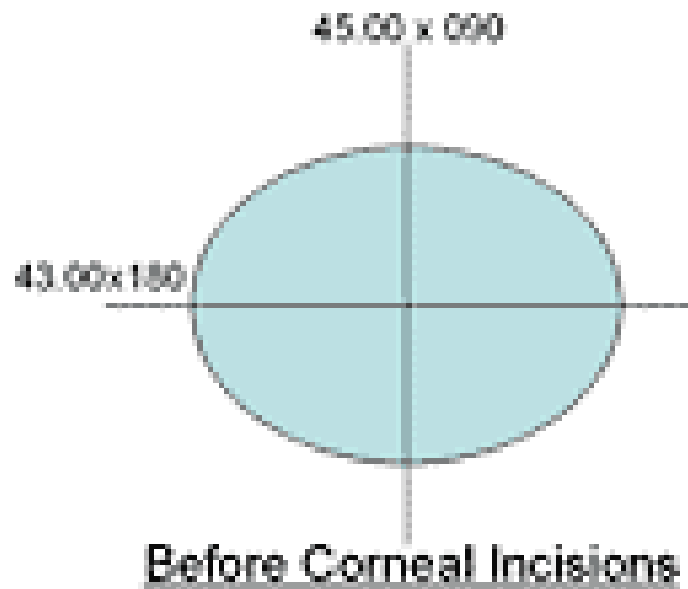
Coupling

Refractive Surgery





Corneal Coupling Effect

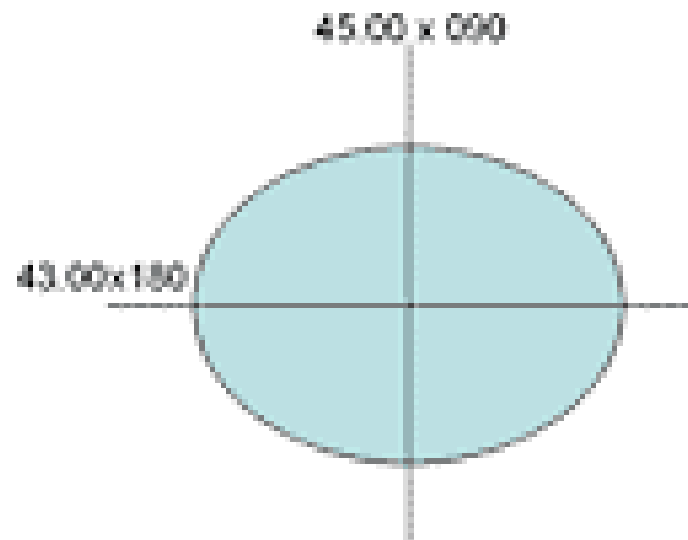


MRx -3.00 + 2.00 x 090
Spherical Equivalent -1.50
K 45.00x090 / 43.00x180

Coupling

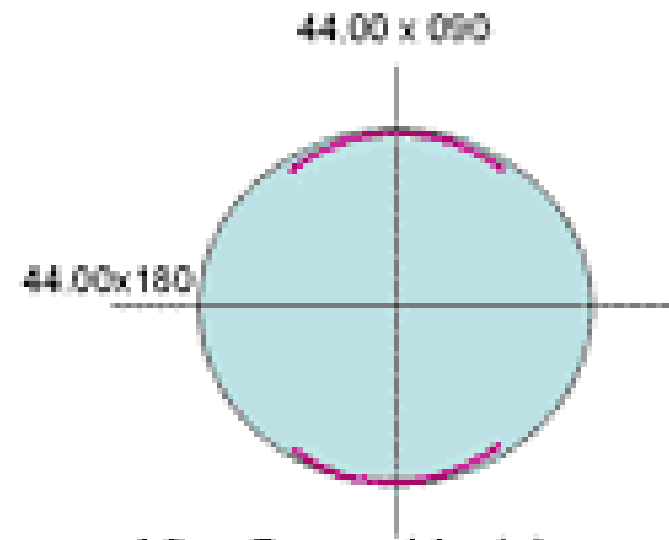


Corneal Coupling Effect



Before Corneal Incisions

MRx $-3.00 + 2.00 \times 090$
Spherical Equivalent -1.50
K $45.00 \times 090 / 43.00 \times 180$

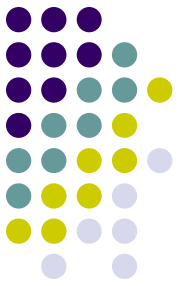


After Corneal Incisions

MRx -1.50 spherical
Spherical Equivalent -1.50
K $44.00 \times 090 / 44.00 \times 180$

Coupling

Incisional Corneal Refractive Surgery



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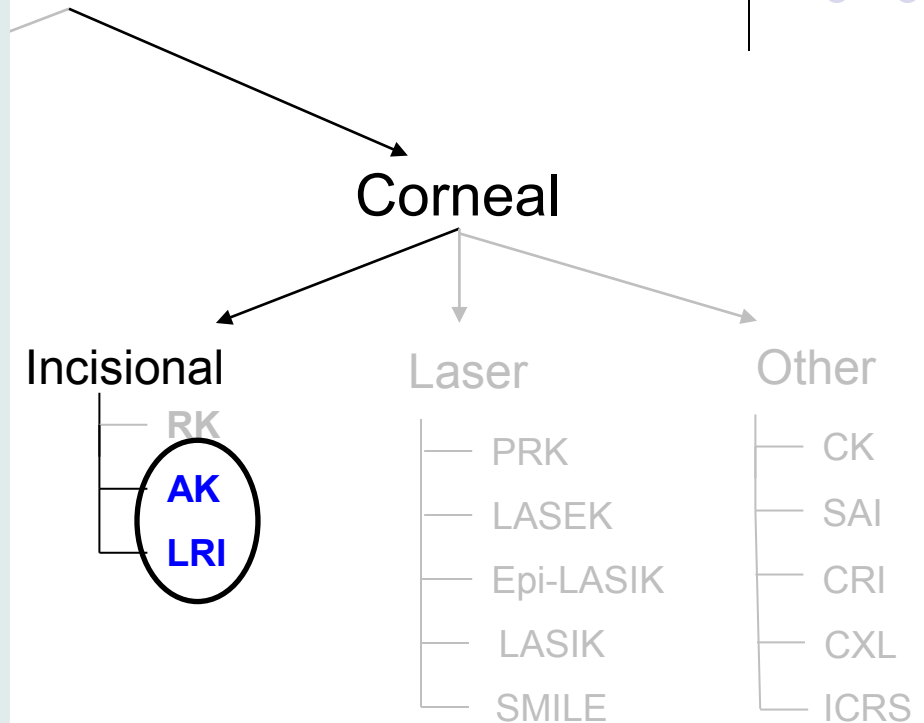
They **steepen** it

What is the name for the phenomenon of incisions producing steepening in the opposite meridian?

Coupling

In this context, what is the coupling ratio?

Refractive Surgery



Incisional Corneal Refractive Surgery



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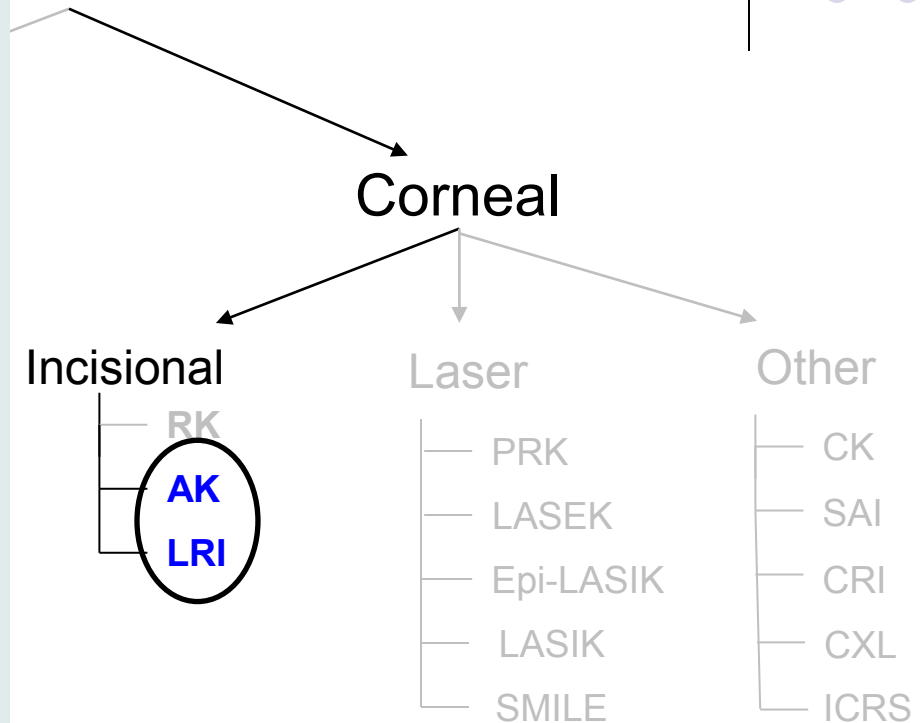
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Refractive Surgery



Incisional Corneal Refractive Surgery



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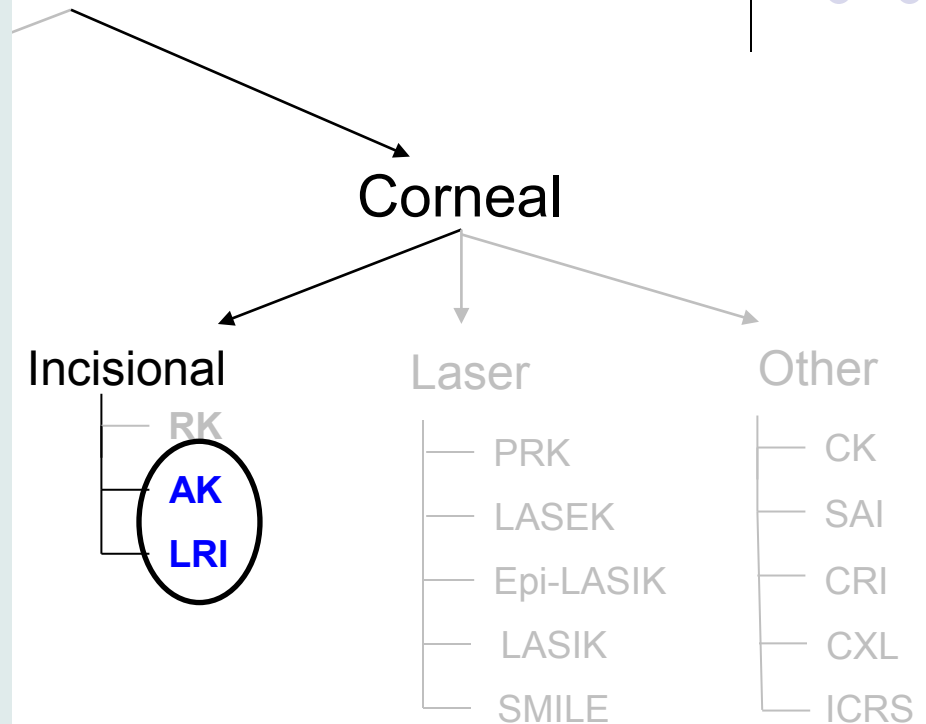
What is the effect of the incisions on the spherical equivalent (SE) of the eye if the coupling ratio is...

>1?

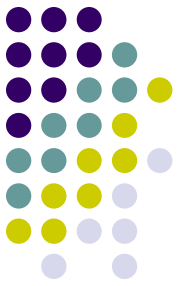
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Refractive Surgery



Incisional Corneal Refractive Surgery



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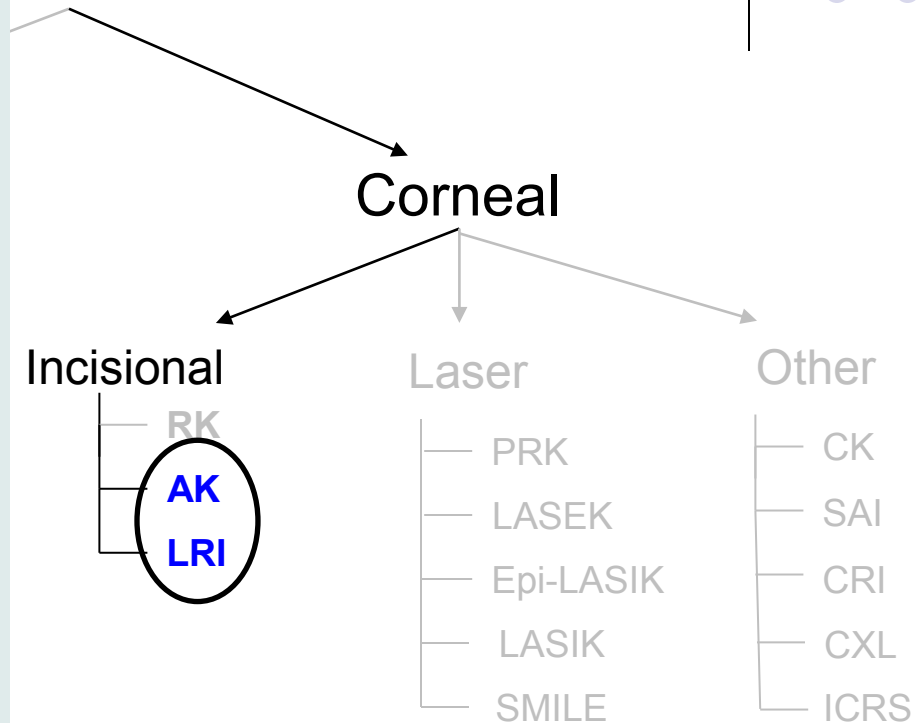
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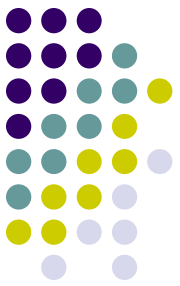
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Refractive Surgery



Incisional Corneal Refractive Surgery



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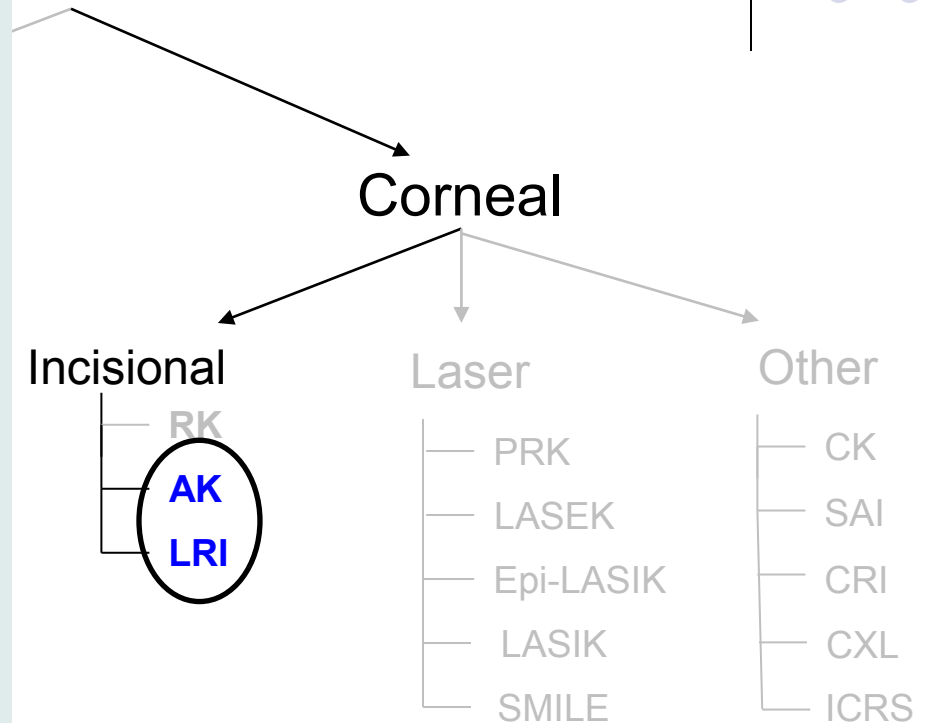
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Refractive Surgery



How do LRIs and AKs fair with respect to coupling ratio?

Incisional Corneal Refractive Surgery



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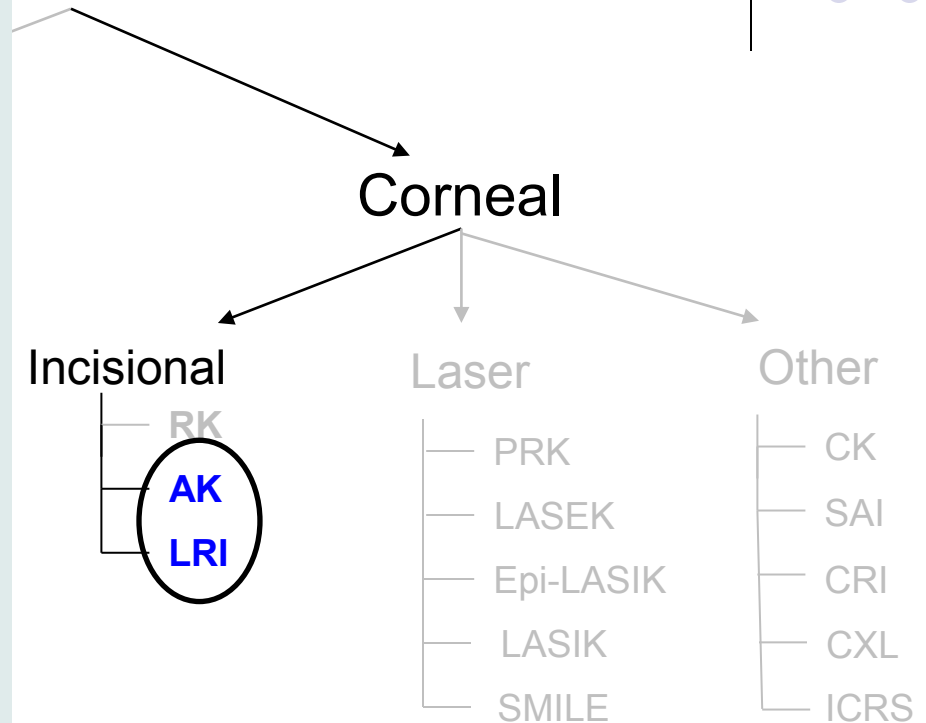
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Refractive Surgery



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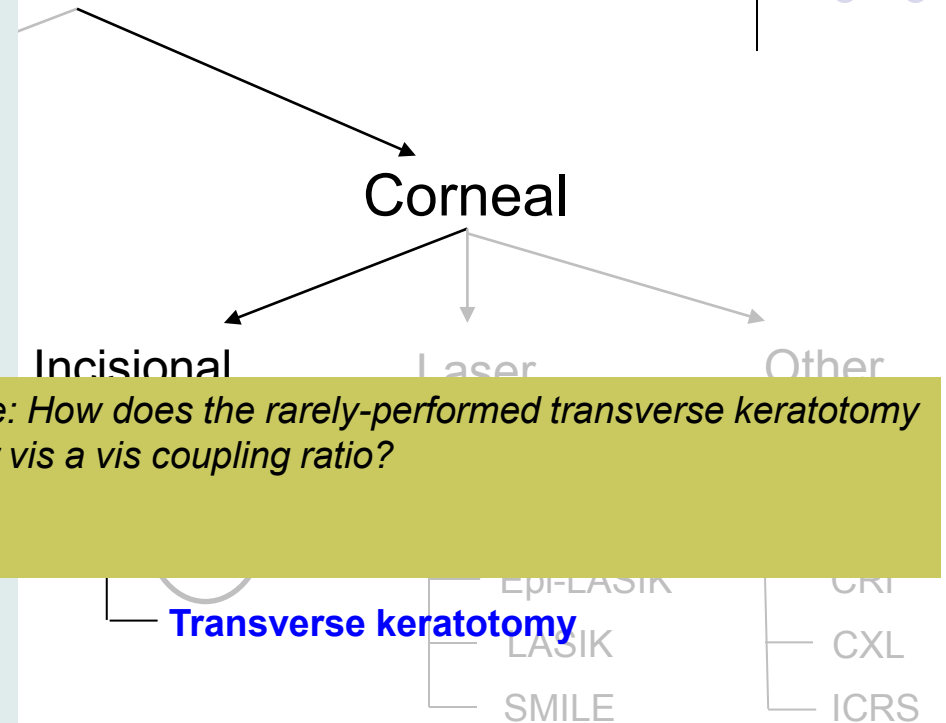
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Refractive Surgery



As an aside: How does the rarely-performed transverse keratotomy incision fair vis a vis coupling ratio?

Transverse keratotomy

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Incisional Corneal Refractive Surgery



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Refractive Surgery

Corneal

Incisional

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It tends to results in ratios

>1 vs =1 vs <1

Transverse keratotomy

EPi-LASIK

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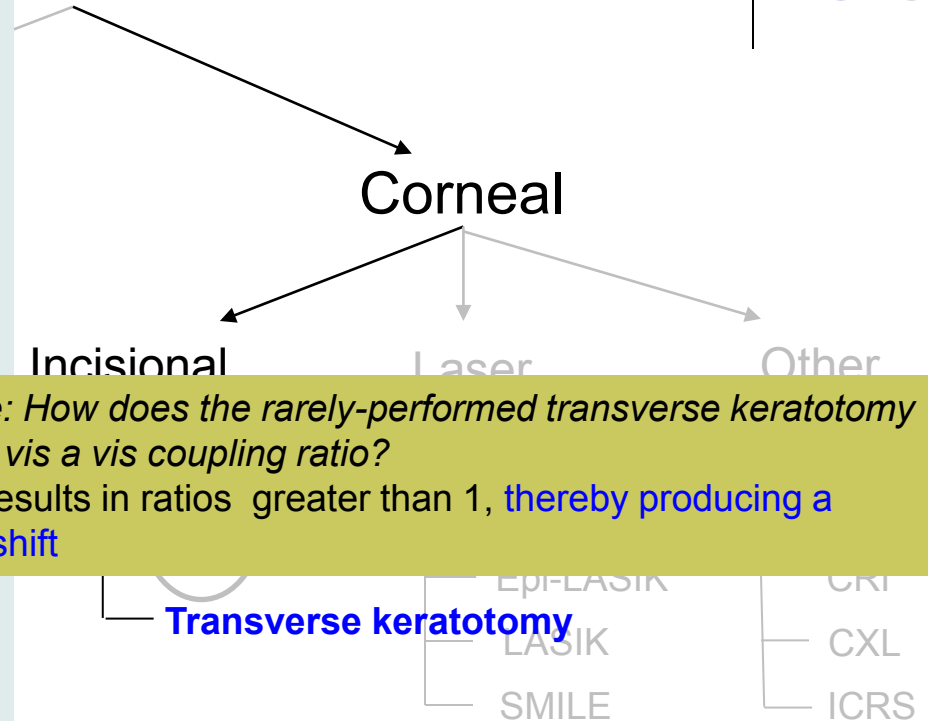
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Refractive Surgery



As an aside: How does the rarely-performed transverse keratotomy incision fair vis a vis coupling ratio?

It tends to results in ratios greater than 1, thereby producing a

hyperopic vs myopic shift

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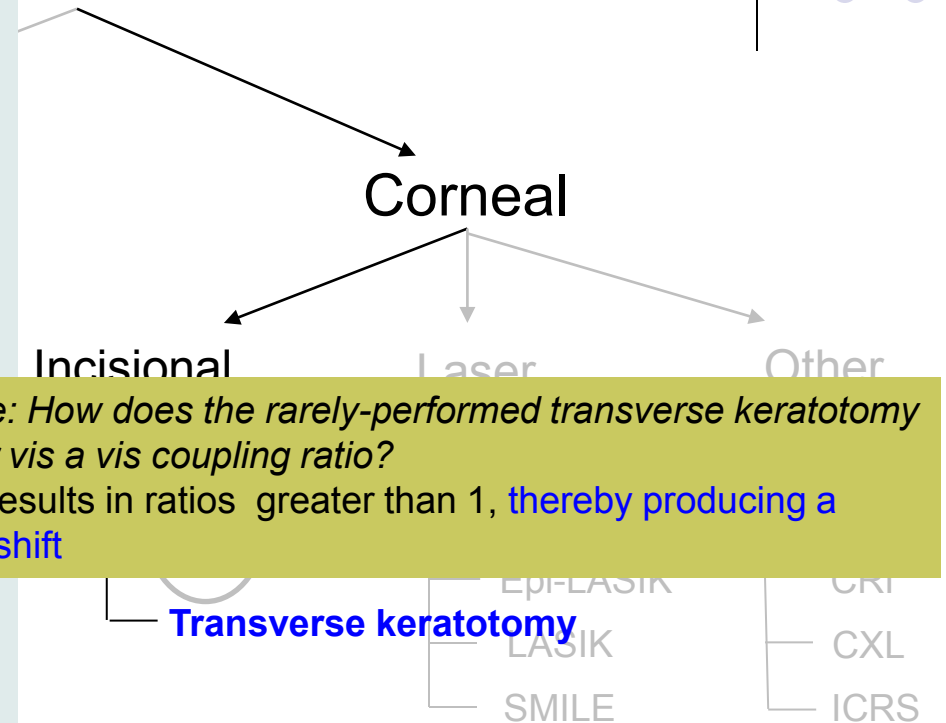
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Refractive Surgery

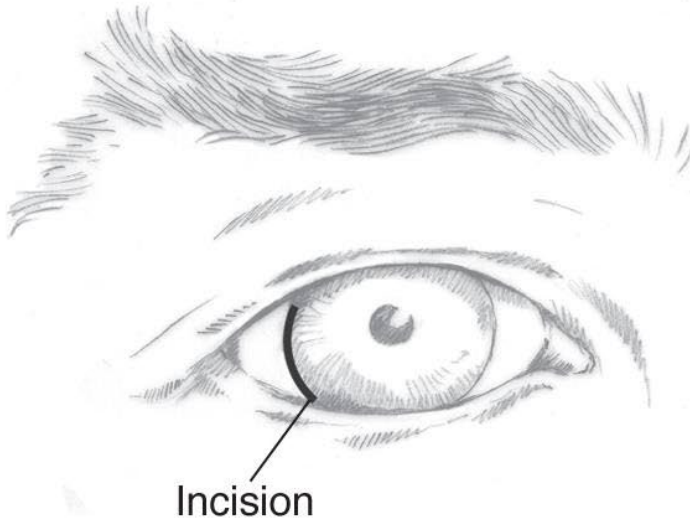


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Incisional Corneal Refractive Surgery

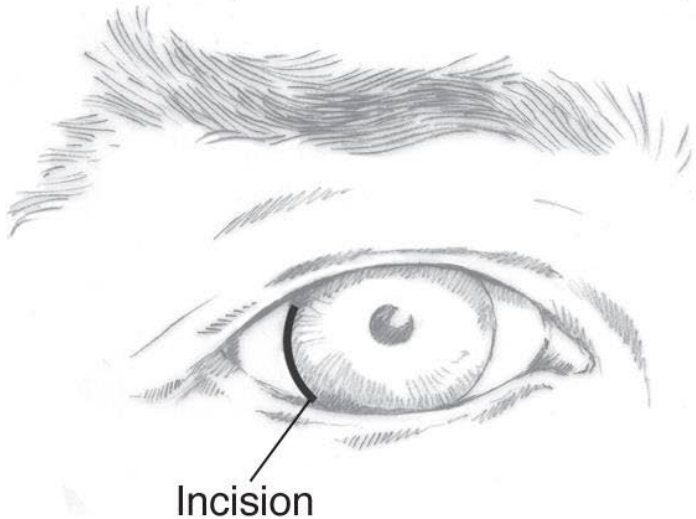


Preoperative *K*: 43.00 @ 90°
45.00 @ 180°
Postoperative *K*: 44.00 @ 90°
44.00 @ 180°

A

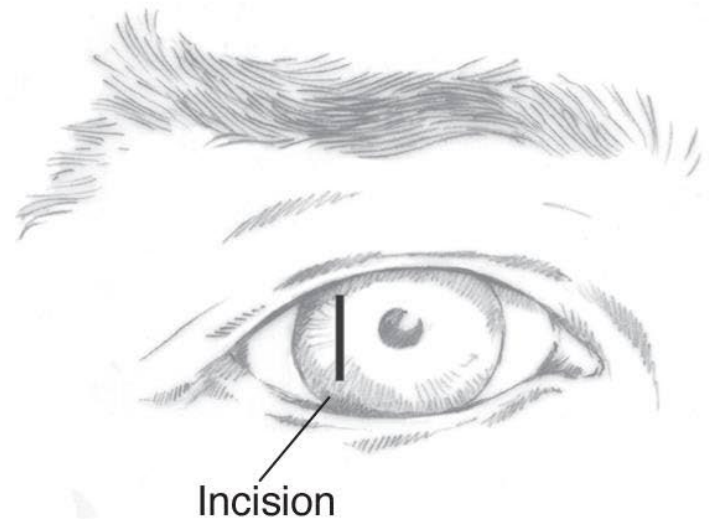
Coupling effect of astigmatic incisions. **A**, A limbal relaxing incision has a coupling ratio of 1.0, and the spherical equivalent and average corneal power are not changed.

Incisional Corneal Refractive Surgery



A

Preoperative *K*: 43.00 @ 90°
45.00 @ 180°
Postoperative *K*: 44.00 @ 90°
44.00 @ 180°



B

Preoperative *K*: 43.00 @ 90°
45.00 @ 180°
Postoperative *K*: 43.50 @ 90°
43.50 @ 180°

Coupling effect of astigmatic incisions. **A**, A limbal relaxing incision has a coupling ratio of 1.0, and the spherical equivalent and average corneal power are not changed.

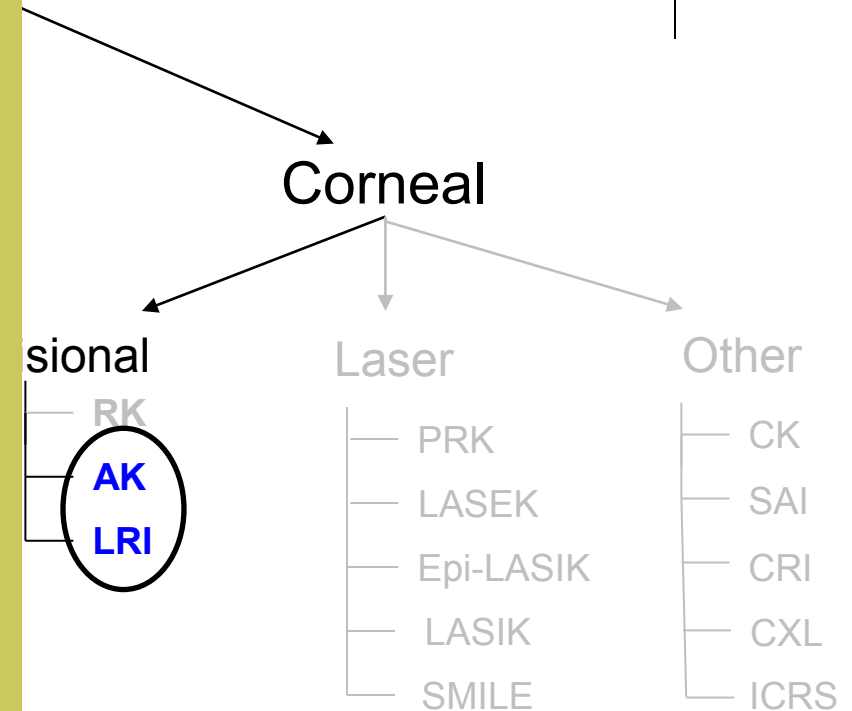
B, A transverse incision has a coupling ratio greater than 1.0, which causes a hyperopic change in refraction by making the average corneal power flatter.

Incisional Corneal Refractive Surgery



With regard to AKs and LRIs, what factors influence their effectiveness?

Refractive
Surgery



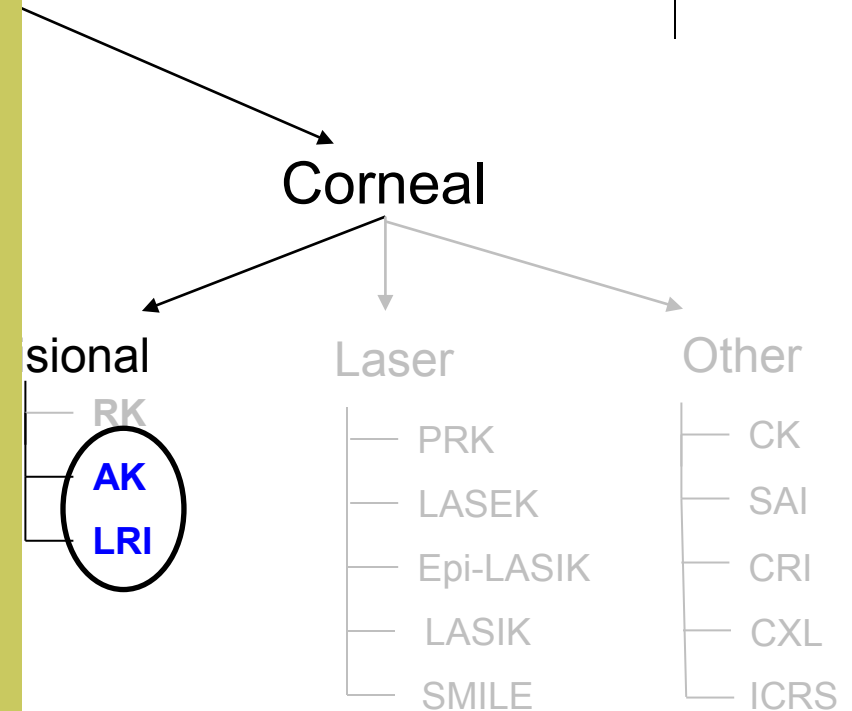
Incisional Corneal Refractive Surgery



With regard to AKs and LRIs, what factors influence their effectiveness?

- Pt [redacted]
- The [redacted] of incisions
- The [redacted] of the incisions
- The [redacted] of the incisions

Refractive
Surgery



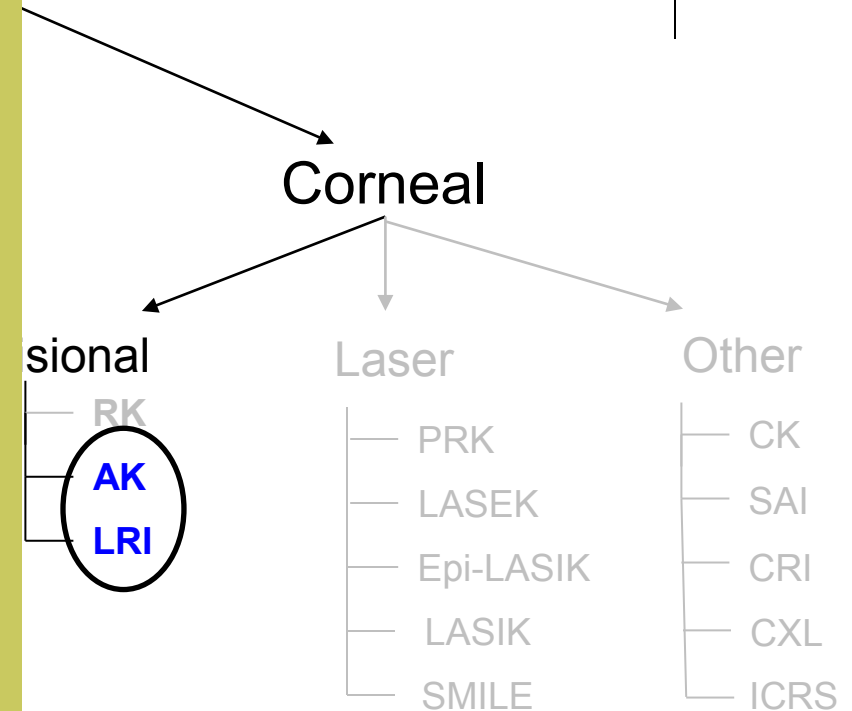
Incisional Corneal Refractive Surgery



With regard to AKs and LRIs, what factors influence their effectiveness?

- Pt age
- The number of incisions
- The length of the incisions
- The depth of the incisions

Refractive
Surgery



Incisional Corneal Refractive Surgery



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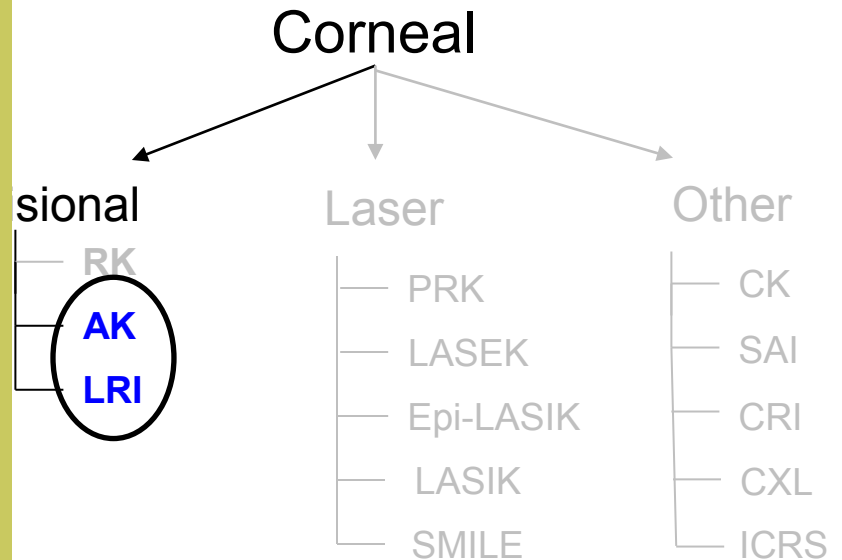
--Pt age

--The num

--The leng

--The depth of the incisions

What is the relationship between pt age and the effect of a given LRI or AK incision?



Incisional Corneal Refractive Surgery



With regard to AKs and LRIs, what factors influence their effectiveness?

--Pt age

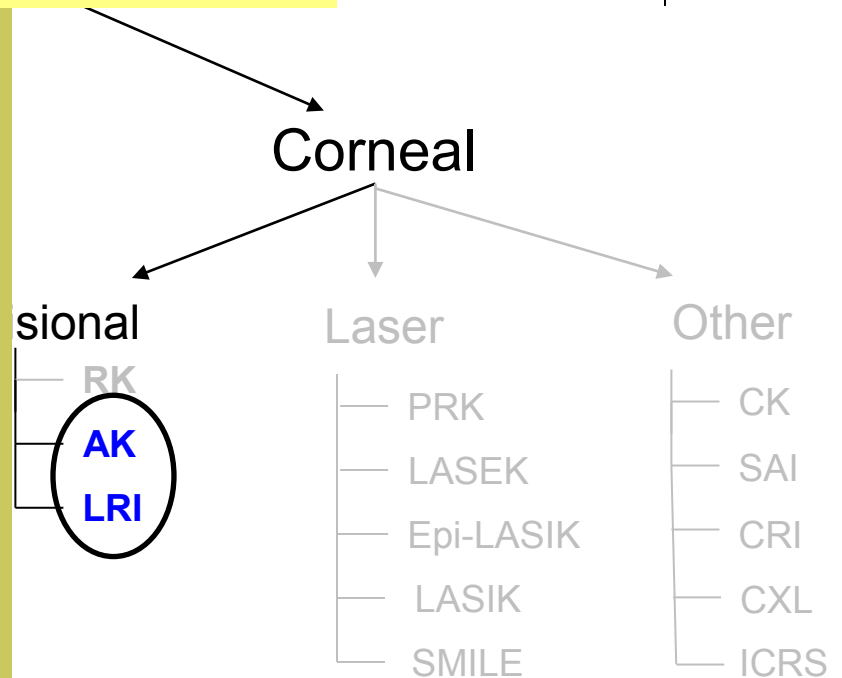
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--The depth of the incisions

What is the relationship between pt age and the effect of a given LRI or AK incision?

The older v younger the pt, the greater will be the effect



Incisional Corneal Refractive Surgery



With regard to AKs and LRIs, what factors influence their effectiveness?

--Pt age

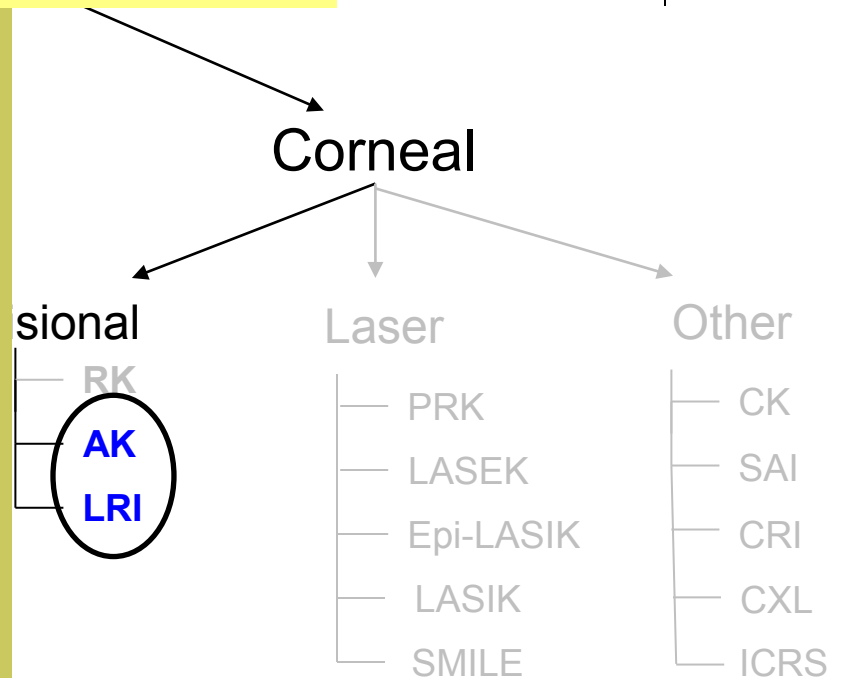
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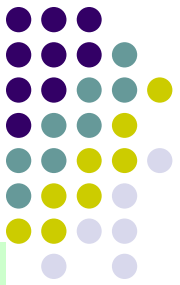
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Incisional Corneal Refractive Surgery

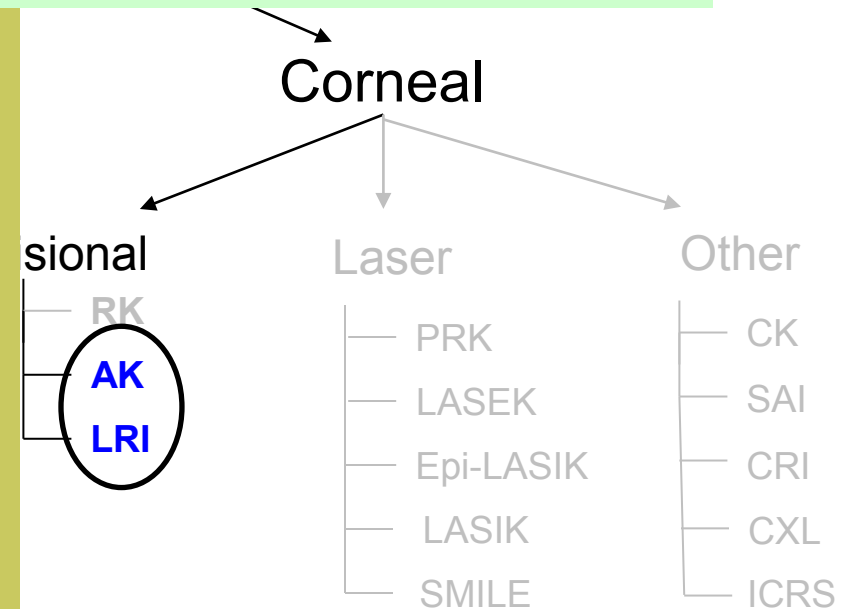


With regard to AKs and LRIs, what factors influence their effectiveness?

- Pt age
- The number of incisions
- The length of the incisions**
- The depth of the incisions

ective
erv

What is the relationship between length and the effect of a given LRI or AK incision?



Incisional Corneal Refractive Surgery



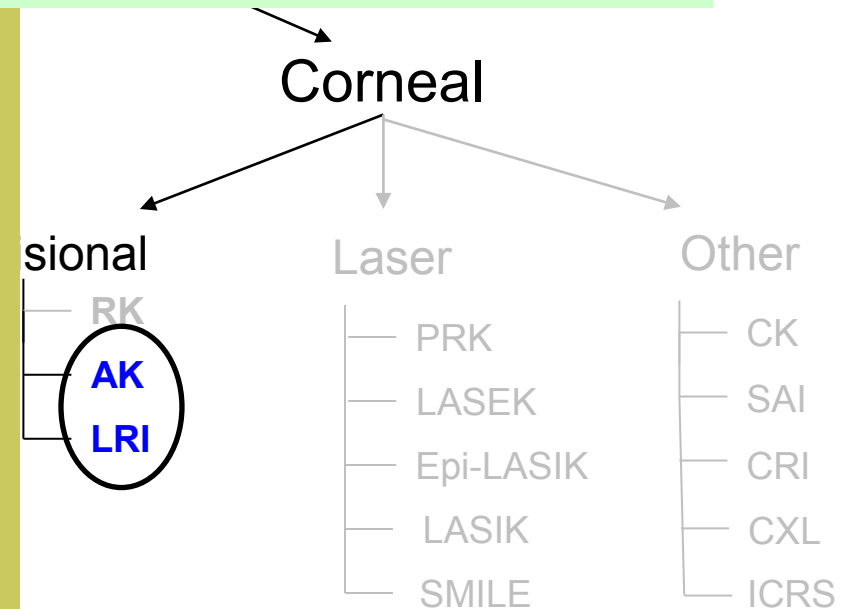
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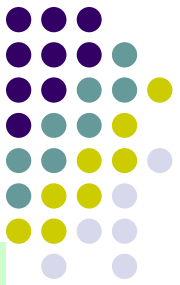
ective
erv

What is the relationship between length and the effect of a given LRI or AK incision?

The longer v shorter the incision, the greater will be the effect



Incisional Corneal Refractive Surgery



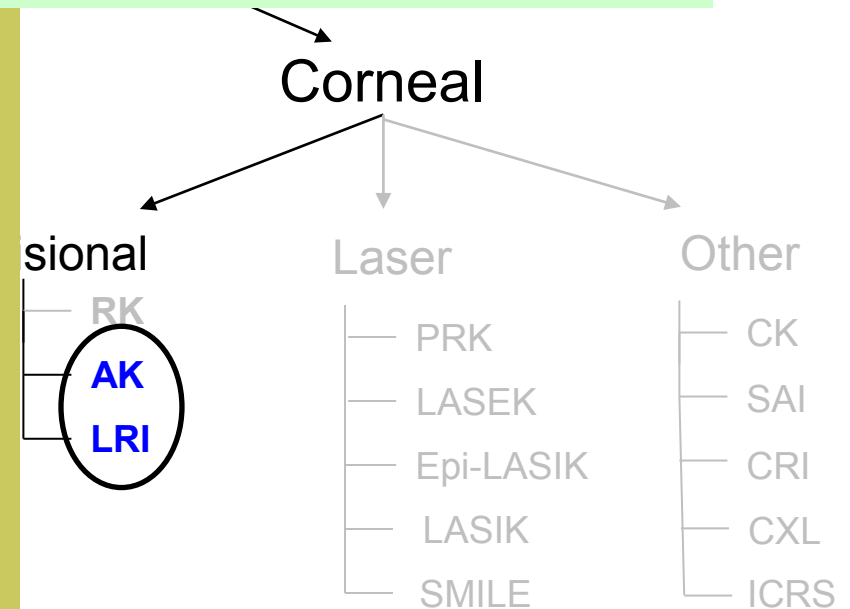
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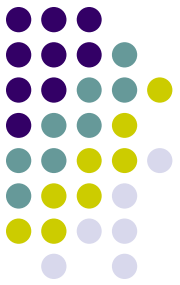
- Pt age
- The number of incisions
- The length of the incisions**
- The depth of the incisions

ective
erv

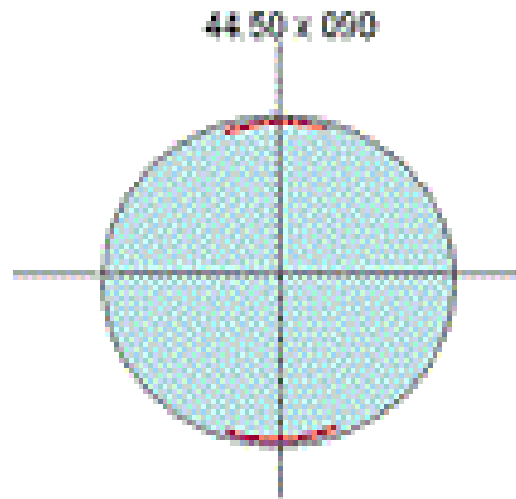
What is the relationship between length and the effect of a given LRI or AK incision?

The longer the incision, the greater will be the effect



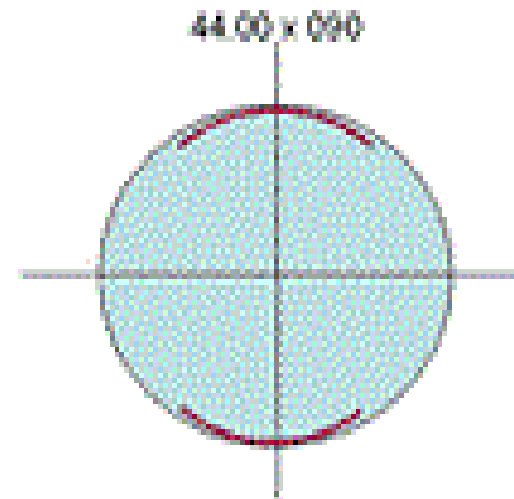


Larger Incisions = More Flattening



Smaller Incisions = Less Flattening

This cornea still has 1 diopter of residual astigmatism



Larger Incisions = More Flattening

This cornea has no residual astigmatism

LRI effect as a function of incision length

Incisional Corneal Refractive Surgery

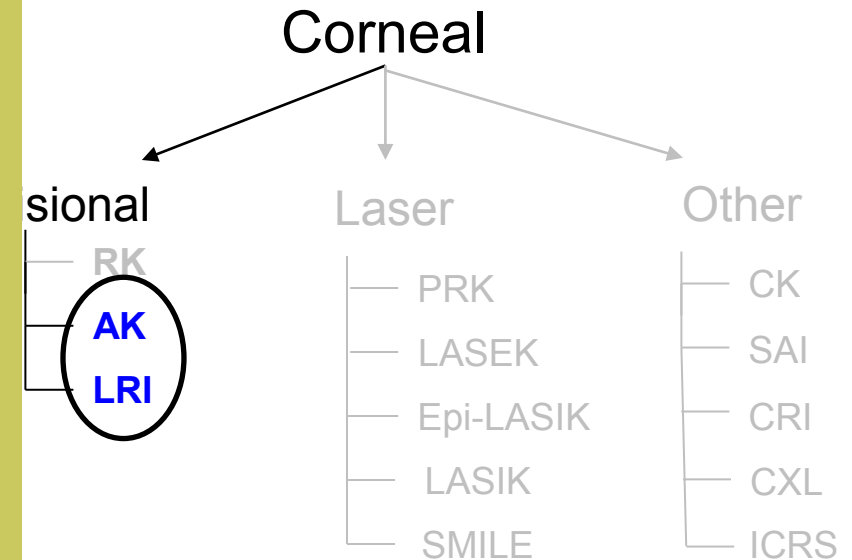


With regard to AKs and LRIs, what factors influence their effectiveness?

- Pt age
- The number of incisions
- The length of the incisions
- The depth of the incisions**

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Generally speaking, one of the two is made to a greater relative depth than the other. Which one?



Incisional Corneal Refractive Surgery

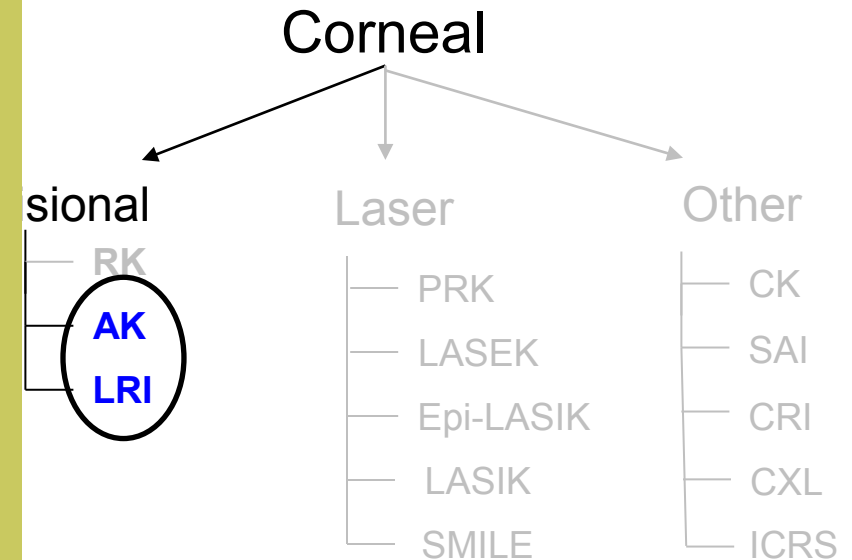


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AK*



Incisional Corneal Refractive Surgery

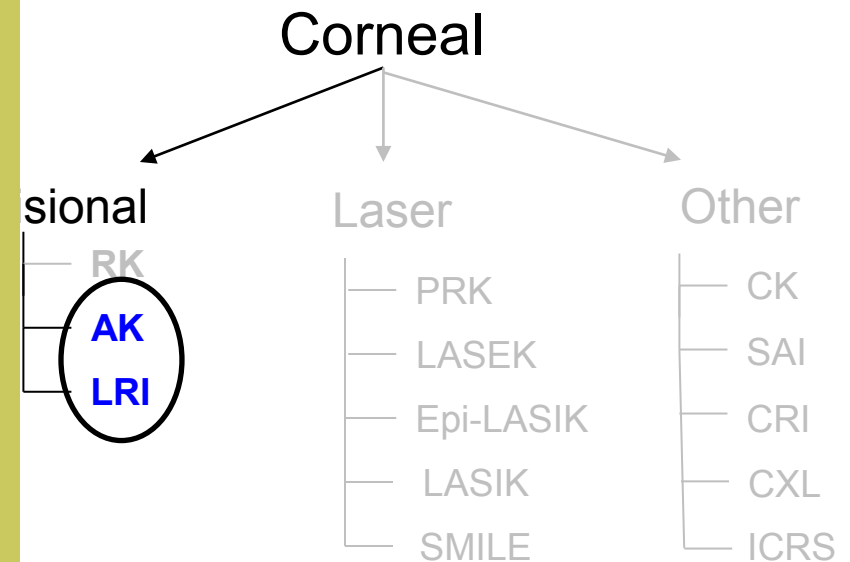


With regard to AKs and LRIs, what factors influence their effectiveness?

Effective

Speaking of effectiveness...For a given incision length and depth, which has more effect on astigmatism: LRIs, or AKs?

--The depth of the incisions



Incisional Corneal Refractive Surgery



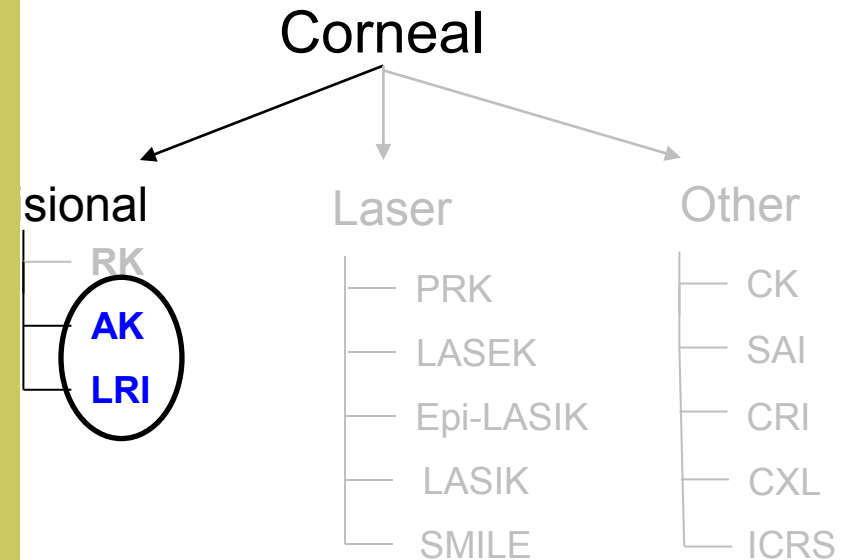
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Effective

Speaking of effectiveness... For a given incision length and depth, which has more effect on astigmatism: LRIs, or AKs?

Because they are more centrally v peripherally located, AK v LRI incisions have a greater effect

--The depth of the incisions



Incisional Corneal Refractive Surgery



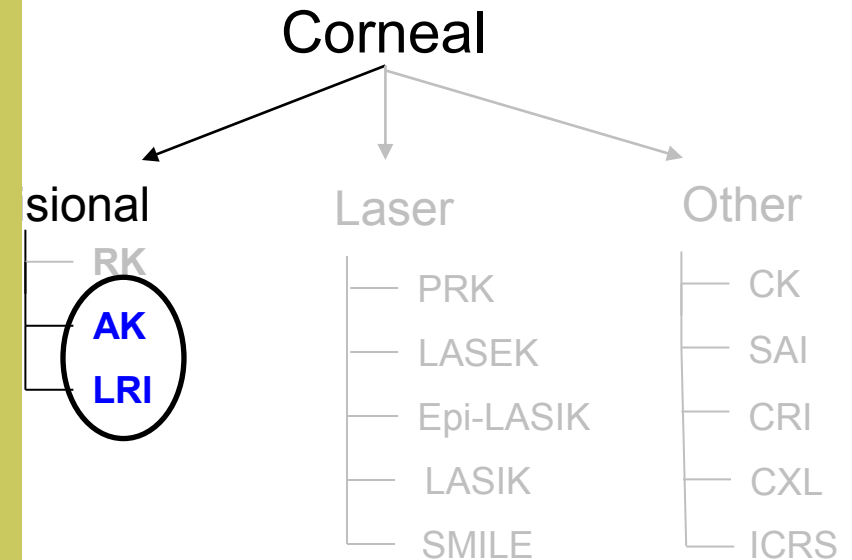
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Incisional Corneal Refractive Surgery



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Because they are more centrally located, AK incisions have a greater effect

--The depth of the incisions

Speaking of effectiveness part deux...There is a means of manipulating the refractive impact of AKs that is not available in LRI use. What is it?

Corneal

Laser

Other

PRK

LASEK

Epi-LASIK

LASIK

SMILE

CK

SAI

CRI

CXL

ICRS

Incisional Corneal Refractive Surgery



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The distance of the incision from the central cornea

Corneal

Laser

Other

PRK

LASEK

Epi-LASIK

LASIK

SMILE

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Incisional Corneal Refractive Surgery



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The distance of the incision from the central cornea

How does the distance between an AK incision and the central cornea impact refractive outcome?

Corneal

Laser

- PRK
- LASEK
- Epi-LASIK
- LASIK
- SMILE

Other

- CK
- SAI
- CRI
- CXL
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Incisional Corneal Refractive Surgery



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The distance of the incision from the central cornea

How does the distance between an AK incision and the central cornea impact refractive outcome?

The closer AKs are to the central cornea, the greater vs less their refractive effect

Corneal

Laser

- PRK
- LASEK
- Epi-LASIK
- LASIK
- SMILE

Other

- CK
- SAI
- CRI
- CXL
- ICRS

Incisional Corneal Refractive Surgery



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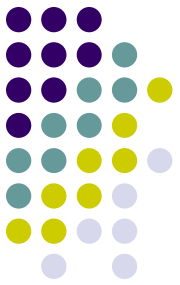
Corneal

Laser

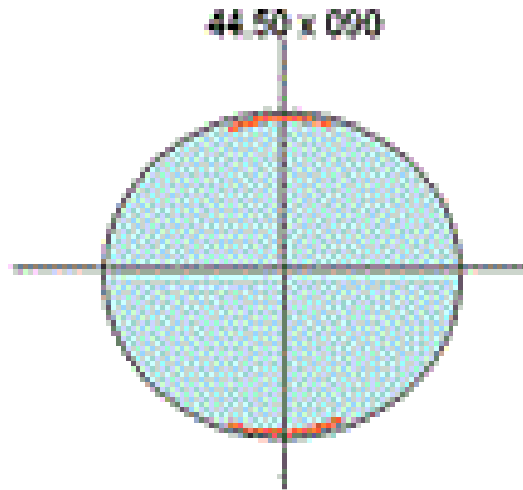
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- LASEK
- Epi-LASIK
- LASIK
- SMILE

Other

- CK
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- CXL
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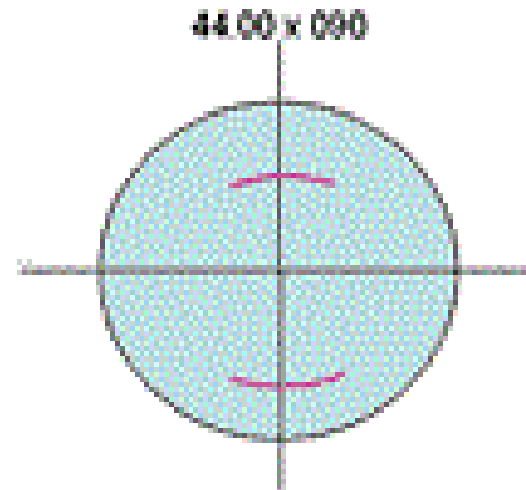


Central Incisions = More Flattening



Peripheral Incisions = Less Flattening

This cornea still has 1 diopter of residual astigmatism



Central Incisions = More Flattening

The same sized incisions placed more centrally result in no residual astigmatism

Astigmatic keratotomy effect as a function of incision location

Incisional Corneal Refractive Surgery



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Effective

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--The depth of the incisions

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The distance of the incision from the central cornea

How does the distance between an AK incision and the central cornea impact refractive outcome?

The closer AKs are to the central cornea, the greater their refractive effect

Why is this not the case for LRIs?

Corneal

Laser

PRK

LASEK

Epi-LASIK

LASIK

SMILE

Other

CK

SAI

CRI

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Incisional Corneal Refractive Surgery



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The distance of the incision from the central cornea

How does the distance between an AK incision and the central cornea impact refractive outcome?

The closer AKs are to the central cornea, the greater their refractive effect

Why is this not the case for LRIs?

Well, it would be, except for the fact that if an incision is placed anywhere but the limbus, then by definition it ain't an LRI

Corneal

Laser

- PRK
- LASEK
- Epi-LASIK
- LASIK
- SMILE

Other

- CK
- SAI
- CRI
- CXL
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Incisional Corneal Refractive Surgery

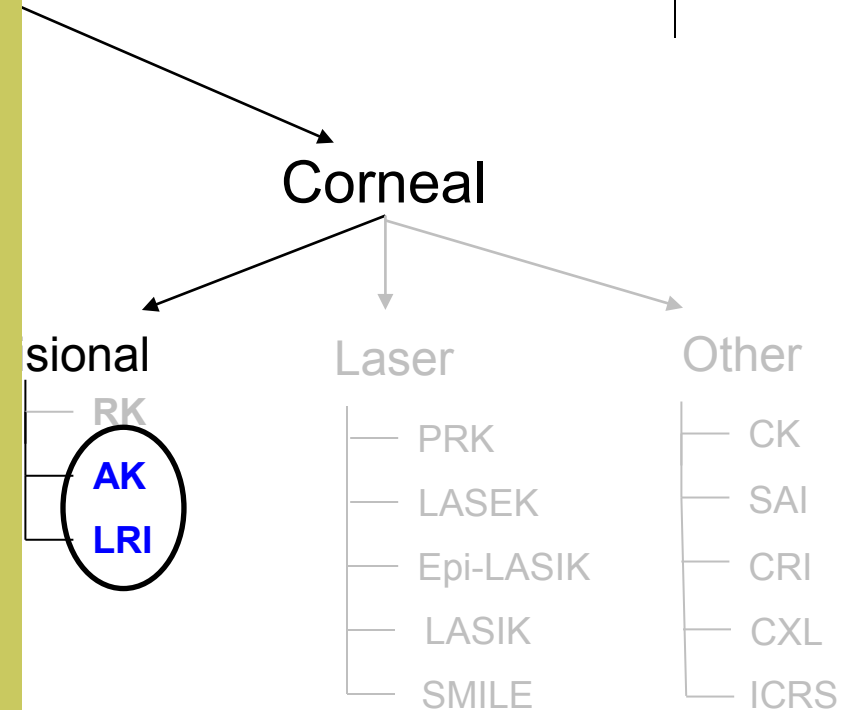


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- Pt age
- The number of incisions
- The length of the incisions
- The depth of the incisions

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography?

Refractive
Surgery



Incisional Corneal Refractive Surgery



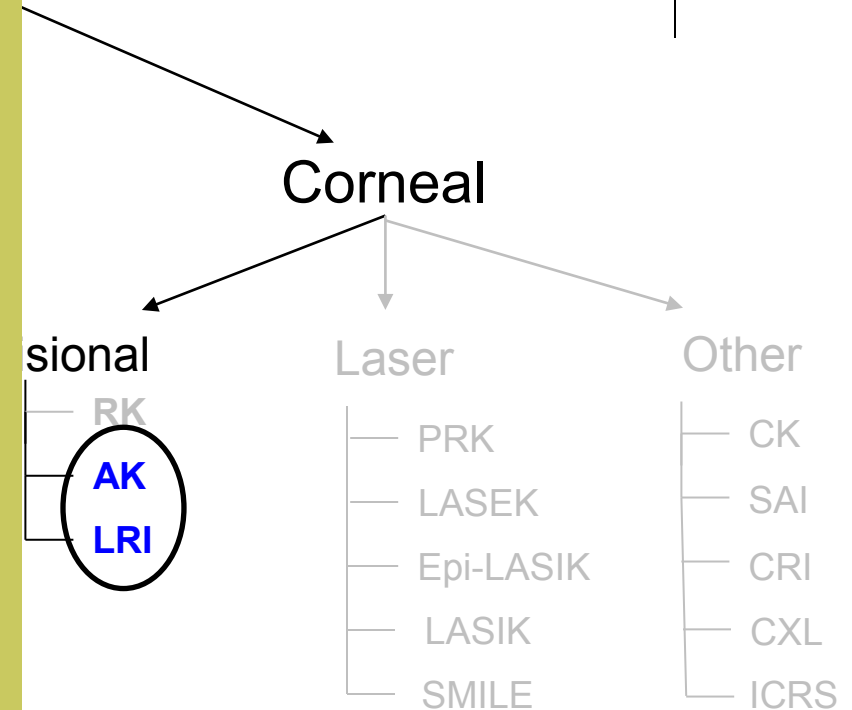
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Refractive
Surgery



Incisional Corneal Refractive Surgery



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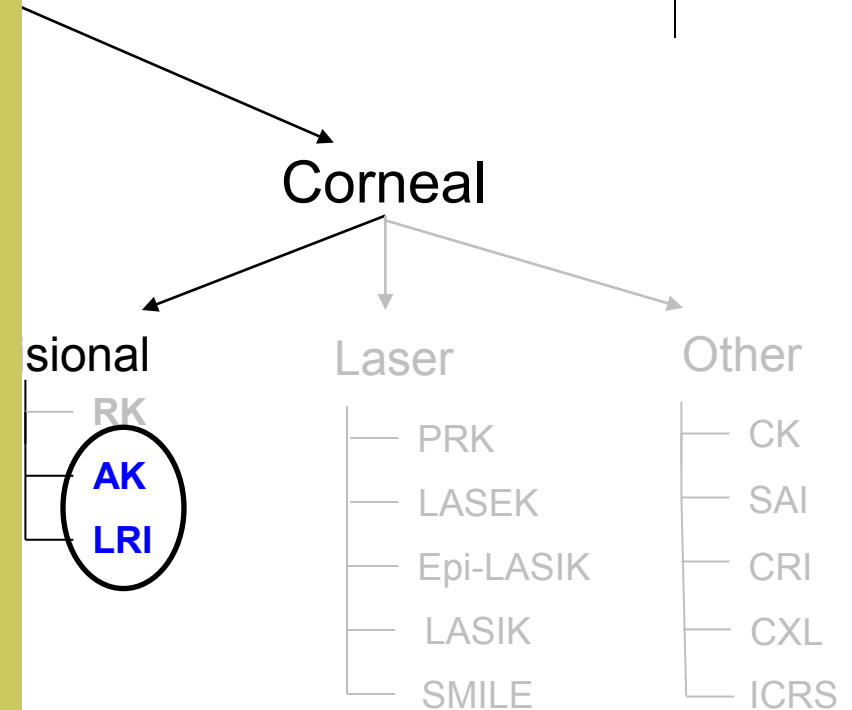
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In contrast, LRIs performed at the time of cataract surgery should be based on corneal topography, because any astigmatism owing to the lens will be dealt with by the CE surgery.

Refractive
Surgery



Incisional Corneal Refractive Surgery



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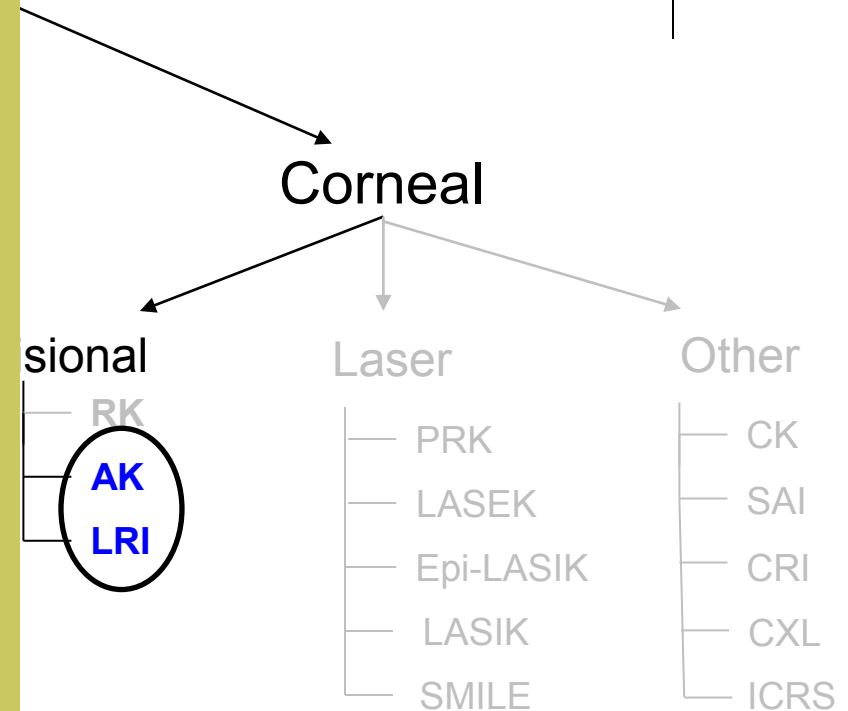
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When marking the pt's eye prior to making the incisions, how should the pt be positioned?

Refractive
Surgery



Incisional Corneal Refractive Surgery



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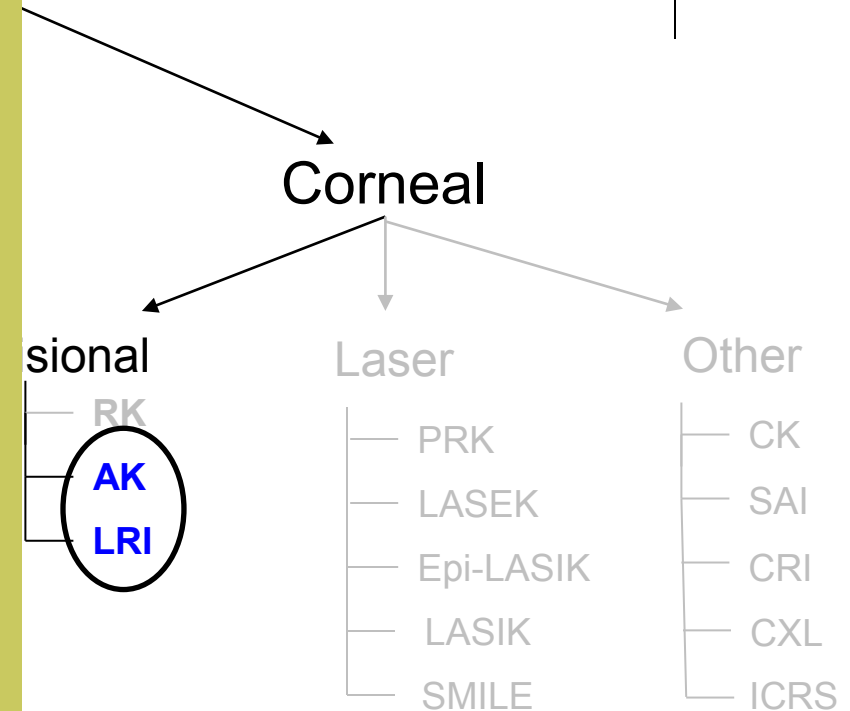
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When marking the pt's eye prior to making the incisions, how should the pt be positioned?

Seated upright

Refractive
Surgery



Incisional Corneal Refractive Surgery



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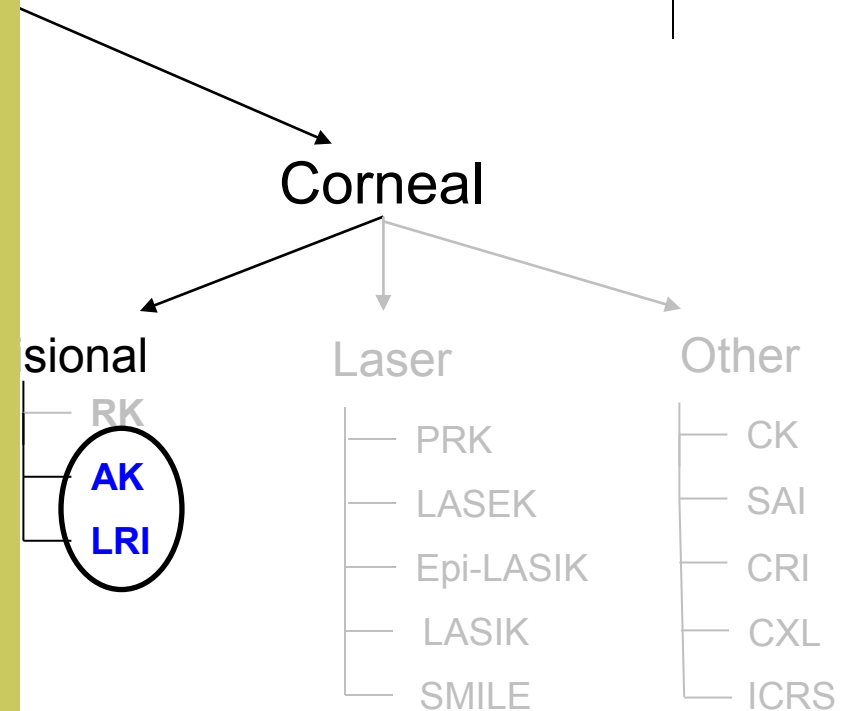
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Why seated upright?

Refractive
Surgery



Incisional Corneal Refractive Surgery



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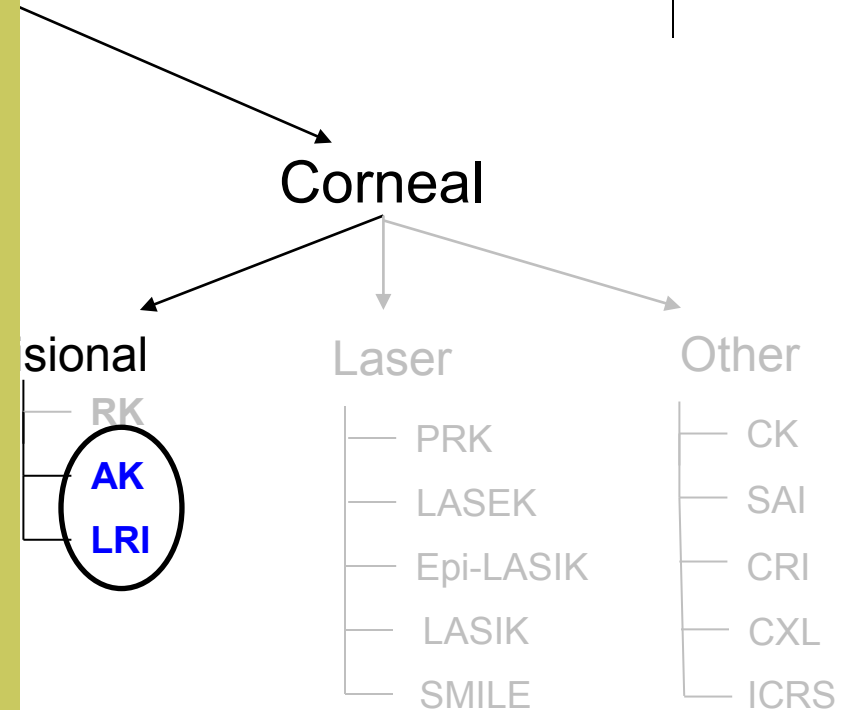
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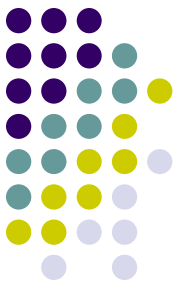
Why seated upright?

In a word—*cyclotorsion*

Refractive
Surgery



Incisional Corneal Refractive Surgery



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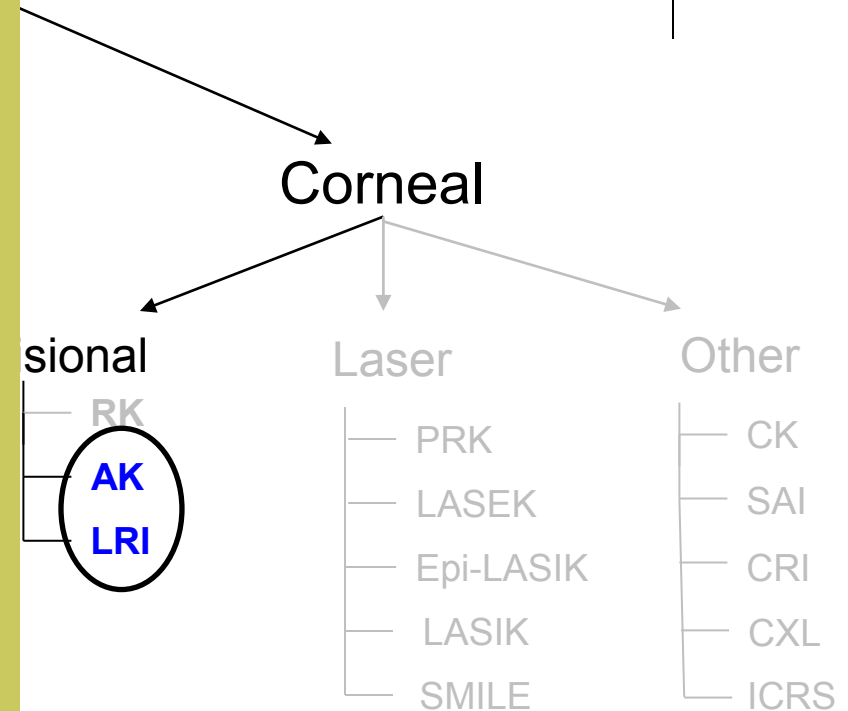
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Seated upright

Why seated upright?

In a word—*cyclotorsion*. When a pt lies down, their eyes rotate up to deg

Refractive
Surgery



Incisional Corneal Refractive Surgery



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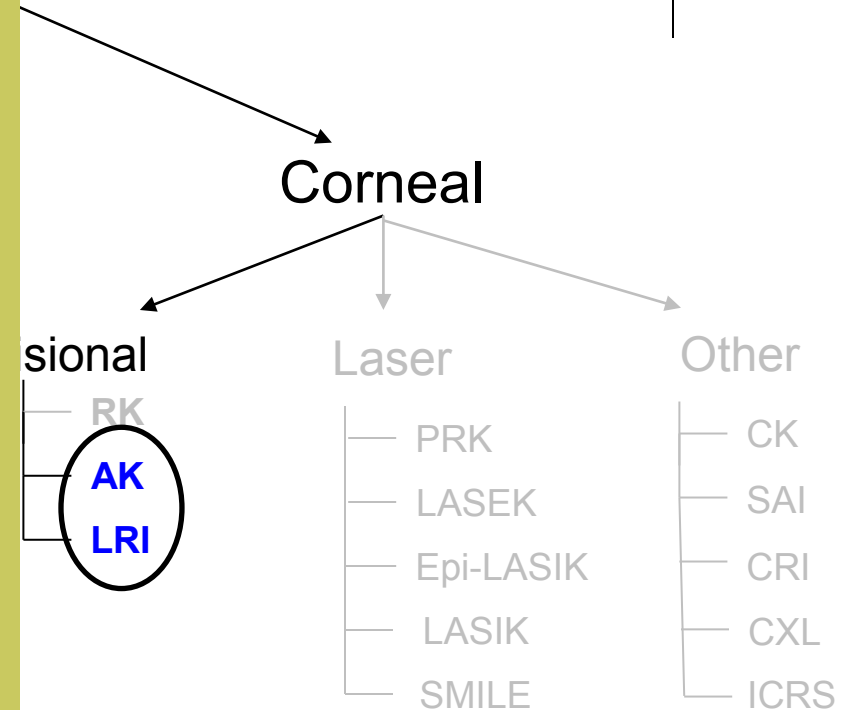
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Refractive
Surgery



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When marking the pt's eye prior to making the incisions, how should the pt be positioned?

Seated upright

Why seated upright?

In a word—*cyclotorsion*. When a pt lies down, their eyes rotate up to 15° . Thus, assuming the pt was refracted and had her pre-op topography performed while seated, incisions based on the position of the eye while the pt is supine will be off by up to 15° !

Refractive
Surgery

