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

Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Iris-fixated

Sulcus-fixated

Corneal

Incisional

RK?

AK

LRI

Laser

PRK

LASEK

Epi-LASIK

LASIK

SMILE

Other

CK

SAI

CRI

CXL

ICRS

What does RK stand for?
What does RK stand for? Radial Keratotomy
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Pseudophakic

Refractive lens exchange (RLE)

Phakic IOL

Iris-fixated

Sulcus-fixated

Corneal

Incisional

RK

AK?

LRI

Laser

PRK

LASEK

Epi-LASIK

LASIK

SMILE

Other

CK

SAI

CRI

CXL

ICRS

What does RK stand for? Radial Keratotomy

What does AK stand for?
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular
- Pseudophakic
  - Refractive lens exchange (RLE)
- Phakic IOL
  - Iris-fixated
  - Sulcus-fixated

Corneal
- Incisional
  - RK
  - AK
  - LRI
- Laser
  - PRK
  - LASEK
  - Epi-LASIK
  - LASIK
  - SMILE
- Other
  - CK
  - SAI
  - CRI
  - CXL
  - ICRS

What does RK stand for?
Radial Keratotomy

What does AK stand for?
Arcuate Keratotomy
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Iris-fixated

Sulcus-fixated

Corneal

Incisional

Laser

Other

Refractive lens exchange (RLE)

Incisional Corneal Refractive Surgery

PRK

LASEK

Epi-LASIK

LASIK

SMILE

RK

AK

LRI?

What does RK stand for? Radial Keratotomy

What does AK stand for? Arcuate Keratotomy

What does LRI stand for?
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Iris-fixated

Sulcus-fixated

Corneal

Incisional

Laser

RK

AK

LRI

PRK

LASEK

Epi-LASIK

LASIK

SMILE

CK

SAI

CRI

CXL

ICRS

What does RK stand for? Radial Keratotomy

What does AK stand for? Arcuate Keratotony

What does LRI stand for? Limbal Relaxing Incisions
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.
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.
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**.
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?

Quite deep--about 85-90% corneal thickness.

How many cuts are made?

Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?

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 to the peripheral cornea.
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 bounded by a 3-4 mm diameter ring)
**Incisional Corneal Refractive Surgery**

- **Refractive Surgery**
  - Intraocular
    - Pseudophakic
    - Phakic IOL (Refractive lens exchange [RLE])
  - Corneal
    - Incisional
    - Laser
      - RK (Radial Keratotomy)
      - PRK
    - Other
      - CK

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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?
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 to the peripheral cornea.
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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Refractive lens exchange (RLE)

Corneal

Incisional

Laser

Other

Incisional Corneal Refractive Surgery

PRK

LASEK

CK

CXL

LASIK

SMILE

Epi-LASIK

RK

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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness

How many cuts are made?

Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately)
Incisional Corneal Refractive Surgery

**Refractive Surgery**

**Intraocular**
- Pseudophakic
- Phakic IOL
  - Refractive lens exchange (RLE)

**Corneal**
- Incisional
  - *RK*
- Laser
  - PRK
- Other
  - CK

---

**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 bounded by a 3-4 mm diameter ring)

**How deep are these cuts made?**
Quite deep--about 85-90% corneal thickness

**How many cuts are made?**
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)
Radial keratotomy

**Figure 2: Incisions**
Images A through E: Example of eye with 4, 8, 12, 16, and 20 incisions.
Radial keratotomy: 78 incisions!
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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?
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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?
The radial cuts gape, causing the peripheral cornea to bulge. This **steepens** the peripheral cornea, which in turn **flattens** the central cornea.
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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?
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 to the peripheral cornea.
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Corneal

Incisional

Laser

Other

Pseudophakic

Phakic IOL

Incisional Corneal Refractive Surgery

PRK

LASEK

CK

ICRS

CXL

LASIK

SMILE

Epi-LASIK

RK

AK

LRI

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. This is why RK can’t be used to treat hyperopia. Recall that hyperopes need additional plus-power to offset their hyperopia. Thus, to correct hyperopia, keratorefractive surgery has to steepen the central cornea to create the needed additional plus-power. But incising the cornea (ie. RK) can only flatten the central cornea—it cannot steepen it. So no RK for hyperopes.

How do radial cuts correct myopia? 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 to the peripheral cornea.
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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?
The radial cuts gape, causing the peripheral cornea to bulge, which steepens the peripheral cornea. This in turn flattens the central cornea. Essentially, RK works by redistributing corneal power from the central cornea to the peripheral cornea.

Steepening of the peripheral cornea leads inevitably to an increase in which higher-order aberration?
Spherical aberration
**Incisional Corneal Refractive Surgery**

Refractive Surgery

Intraocular

- Pseudophakic
- Phakic IOL
  - Refractive lens exchange (RLE)

Corneal

- Incisional
- Laser
  - PRK
- Other
  - CK

**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 of the cornea bounded by a 3-4 mm diameter ring)

**How deep are these cuts made?**
Quite deep--about 85-90% corneal thickness

**How many cuts are made?**
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

**How do radial cuts correct myopia?**
The radial cuts gape, causing the peripheral cornea to bulge, which in turn flattens the central cornea. Essentially, RK works by redistributing corneal power from the central cornea to the peripheral cornea.

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

*This steepens the peripheral cornea.*
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

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

Prolate

After RK (and other myopic keratorefractive procedures), this relationship is often reversed; ie, the central cornea is flatter than the peripheral cornea. What is the term for this shape?

Oblate
Briefly, how is RK performed?
Radial incisions are made that extend from the peripheral cornea to the edge of the ‘optical zone’ (central portion)
How deep are these cuts made?
Quite deep—about 85-90% corneal thickness
How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)
How do radial cuts correct myopia?
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 to the peripheral cornea.

*The native, normal cornea is steeper centrally than it is peripherally. What is the term for this shape? Prolate*
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

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

How much steeper (in diopters) is the typical central cornea than the typical peripheral cornea?
3-4
**Incisonal Corneal Refractive Surgery**

Refractive Surgery

- Intraocular
  - Pseudophakic
  - Phakic IOL

- Corneal
  - Incisional
    - RK
  - Laser
    - PRK
  - Other
    - CK

**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 bounded by a 3-4 mm diameter ring).

**How deep are these cuts made?**
Quite deep—about 85-90% corneal thickness.

**How many cuts are made?**
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

**How do radial cuts correct myopia?**
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 to the peripheral cornea.

**The native, normal cornea is steeper centrally than it is peripherally.**

**What is the term for this shape?**
Prolate

**How much steeper (in diopters) is the typical central cornea than the typical peripheral cornea?**
3-4

**How do radial cuts correct myopia?**
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 to the peripheral cornea.
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

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

After RK (and other myopic keratorefractive procedures), this relationship is often reversed; ie, the central cornea is flatter than the peripheral cornea. What is the term for this shape?
**Oblate**
In two words, what is the main short-term problem with RK?
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

In two words, what is the main short-term problem with RK?
‘Diurnal fluctuation’

What does this refer to?
To the fact that a significant proportion of RK eyes are more hyperopic upon awakening in the morning.

Is this hyperopic shift permanent?
No. As the day proceeds, the extra hyperopia 'wears off,' and the eye reverts to its previous state.

What accounts for diurnal fluctuation?
Hypoxic edema. Closed eyelids during sleep deprive the cornea of O2, and the resulting hypoxia causes the incisions to swell a little. This swelling in turn induces increased flattening of the central cornea, resulting in more hyperopia. After several hours of O2 exposure while the eyes are open, the edema dissipates, and the excess hyperopia resolves.
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

In two words, what is the main short-term problem with RK?
‘Diurnal fluctuation’

What does this refer to?
To the fact that a significant proportion of RK eyes are more hyperopic upon awakening in the morning. Is this hyperopic shift permanent? No. As the day proceeds, the extra hyperopia ‘wears off,’ and the eye reverts to its previous state. What accounts for diurnal fluctuation? Hypoxic edema. Closed eyelids during sleep deprive the cornea of O2, and the resulting hypoxia causes the incisions to swell a little. This swelling in turn induces increased flattening of the central cornea, resulting in more hyperopia. After several hours of O2 exposure while the eyes are open, the edema dissipates, and the excess hyperopia resolves.
In two words, what is the main short-term problem with RK?
‘Diurnal fluctuation’

What does this refer to?
To the fact that a significant proportion of RK eyes are more hyperopic upon awakening in the morning.
In two words, what is the main short-term problem with RK?
'Diurnal fluctuation'

What does this refer to?
To the fact that a significant proportion of RK eyes are more hyperopic upon awakening in the morning

Is this hyperopic shift permanent?
Yes. As the day proceeds, the extra hyperopia 'wears off,' and the eye reverts to its previous state.

What accounts for diurnal fluctuation?
Hypoxic edema. Closed eyelids during sleep deprive the cornea of O₂, and the resulting hypoxia causes the incisions to swell a little. This swelling in turn induces increased flattening of the central cornea, resulting in more hyperopia. After several hours of O₂ exposure while the eyes are open, the edema dissipates, and the excess hyperopia resolves.
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Corneal

Incisional

Laser

Other

Incisional Corneal Refractive Surgery

PRK

LASEK

CK

CXL

LASIK

SMILE

Epi-LASIK

RK

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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?

Quite deep—about 85-90% corneal thickness.

How many cuts are made?

Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?

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 to the peripheral cornea.

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

‘Diurnal fluctuation’

What does this refer to?

To the fact that a significant proportion of RK eyes are more hyperopic upon awakening in the morning.

Is this hyperopic shift permanent?

No. As the day proceeds, the extra hyperopia ‘wears off,’ and the eye reverts to its previous state.

What accounts for diurnal fluctuation?

Hypoxic edema. Closed eyelids during sleep deprive the cornea of O2, and the resulting hypoxia causes the incisions to swell a little. This swelling in turn induces increased flattening of the central cornea, resulting in more hyperopia. After several hours of O2 exposure while the eyes are open, the edema dissipates, and the excess hyperopia resolves.
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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

In two words, what is the main short-term problem with RK?
‘Diurnal fluctuation’.

What does this refer to?
To the fact that a significant proportion of RK eyes are more hyperopic upon awakening in the morning.

Is this hyperopic shift permanent?
No. As the day proceeds, the extra hyperopia ‘wears off,’ and the eye reverts to its previous state.

What accounts for diurnal fluctuation?
Hypoxic edema. Closed eyelids during sleep deprive the cornea of O2, and the resulting hypoxia causes the incisions to swell a little. This swelling in turn induces increased flattening of the central cornea, resulting in more hyperopia. After several hours of O2 exposure while the eyes are open, the edema dissipates, and the excess hyperopia resolves.
Refractive Surgery

Incisional Corneal Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Corneal

Incisional

Laser

Other

Refractive lens

PRK

RK

CK

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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

In two words, what is the main short-term problem with RK?
‘Diurnal fluctuation.’

What does this refer to?
To the fact that a significant proportion of RK eyes are more hyperopic upon awakening in the morning.

Is this hyperopic shift permanent?
No. As the day proceeds, the extra hyperopia ‘wears off,’ and the eye reverts to its previous state.

What accounts for diurnal fluctuation?
**Hypoxic edema.** Closed eyelids during sleep deprive the cornea of O₂, and the resulting hypoxia causes the incisions to swell a little. This swelling in turn induces increased flattening of the central cornea, resulting in more hyperopia. After several hours of O₂ exposure while the eyes are open, the edema dissipates, and the excess hyperopia resolves.
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Phakic IOL

Pseudophakic

Corneal

Laser

Incisional

PRK

RK

CK

Other

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, typically about 3-4 mm diameter).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

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

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?
Just over 40!
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

- Pseudophakic
- Phakic IOL (Refractive lens exchange [RLE])

Corneal

- Incisional
  - RK
- Laser
  - PRK
- Other
  - CK

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). These cuts help to redistribute corneal power from the central cornea to the peripheral cornea.

In two words, what is the main long-term problem with RK?
‘Hyperopic drift’
(Note: ‘Hyperopic drift’ is aka progressive flattening effect of surgery)

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?
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 to the peripheral cornea.

In 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?
Just over 40!

(Note: ‘Hyperopic drift’ is aka progressive flattening effect of 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 of the cornea that is not ablated). Such incisions redistribute corneal power from the central cornea to the peripheral cornea.

In two words, what is the main long-term problem with RK?
‘Hyperopic drift’

What does this refer to?

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 to the peripheral cornea.
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 that can be blamed for a person’s visual acuity).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

In two words, what is the main long-term problem with RK?
‘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.
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) and into the stroma. Refraction is changed by changing the corneal curvature.

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

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? Just over 40!
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) to the edge of the globe. Such incisions are also made in the clear corneal tissue.

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

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 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 to the peripheral cornea.
**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 of the cornea which is neither too flat nor too steep).

**For those pts with visually significant hyperopic drift, are they candidates for corrective keratorefractive surgery?**
Yes, they can be treated with a keratoablativelaser procedure (eg LASIK; PRK).

**In two words, what is the main long-term problem with RK?**
‘Hyperopic drift’

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? Over 40%

For those pts with visually significant hyperopic drift, are they candidates for corrective keratorefractive surgery? Yes, they can be treated with a keratoablativelaser 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.
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) and beyond. Radial incisions are deeper than lamellar incisions.

In two words, what is the main long-term problem with RK?
‘Hyperopic drift’

For those pts with visually significant hyperopic drift, are they candidates for corrective keratorefractive surgery?
Yes, they can be treated with a keratoablative laser procedure (eg LASIK; PRK)

Intraocular

Corneal

Pseudophakic

Phakic IOL

Incisional

Laser

Other

Refractive lens exchange (RLE)

Incisional Corneal Refractive Surgery

PRK

LASEK

CK

ICRS

CXL

LASIK

SMILE

Epi-LASIK

RK

AK

LRI

Briefly, how is RK performed?
Radial incisions are made that extend from the peripheral cornea to the edge of the ‘optical zone’ (central part of the cornea) and beyond. Radial incisions are deeper than lamellar incisions.

In two words, what is the main long-term problem with RK?
‘Hyperopic drift’

For those pts with visually significant hyperopic drift, are they candidates for corrective keratorefractive surgery?
Yes, they can be treated with a keratoablative laser procedure (eg LASIK; PRK)

Intraocular

Corneal

Pseudophakic

Phakic IOL

Incisional

Laser

Other

Refractive lens exchange (RLE)

Incisional Corneal Refractive Surgery

PRK

LASEK

CK

ICRS

CXL

LASIK

SMILE

Epi-LASIK

RK

AK

LRI
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), which is the area for vision.

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

In two words, what is the main long-term problem with RK?
‘Hyperopic drift’

For those pts with visually significant hyperopic drift, are they candidates for corrective keratorefractive surgery?
Yes, they can be treated with a keratoablation 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.
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) about 3-4 mm in diameter.

In two words, what is the main long-term problem with RK?
‘Hyperopic drift’

For those pts with visually significant hyperopic drift, are they candidates for corrective keratorefractive surgery?
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.
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 of the cornea bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery.

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

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

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!.
What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract 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 of the cornea) to flatten it and correct myopia.

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

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 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 to the peripheral cornea.
Incisional Corneal Refractive Surgery

**What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)**
Imprecision in IOL calculations for cataract surgery

**Why does RK lead to imprecise IOL calcs?**

*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, bounded by a 3-4 mm diameter ring)

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

*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 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 to the peripheral cornea.
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.)

Imprecision in IOL calculations for cataract surgery

Why does RK lead to imprecise IOL calc?

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.

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 bounded by a 3-4 mm diameter ring).

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

‘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.

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 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 to the peripheral cornea.
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 bounded by a 3-4 mm diameter ring). 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 to the peripheral cornea.

What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

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!
In incisional corneal refractive surgery, radial keratotomy (RK) is a procedure where radial incisions are made in the peripheral cornea to redistribute corneal power. The radial cuts gape, causing the peripheral cornea to bulge and steepen, which in turn flattens the central cornea. Essentially, RK works by redistributing corneal power from the central cornea to the peripheral cornea.

**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 bounded by a 3-4 mm diameter ring).

**How deep are these cuts made?**
Quite deep—about 85-90% corneal thickness.

**How many cuts are made?**
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

**How do radial cuts correct myopia?**
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 to the peripheral cornea.

**What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)**
Imprecision in IOL calculations for cataract surgery.

**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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

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

**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%.
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.) Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

If standard IOL calc techniques are applied to an RK eye, will the resulting ‘refractive surprise’ be myopic, or 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, bounded by a 3-4 mm diameter ring). In two words, what is the main long-term problem with RK? ‘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

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 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 to the peripheral cornea.
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.)
Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

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

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 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 to the peripheral cornea.

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:

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 IOL power that pops out of those calcs
Incisional Corneal Refractive Surgery

What is the other main problem associated with RK? (Hint: It's not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

If standard IOL calculations are applied to an RK eye, will the resulting ‘refractive surprise’ be myopic, or hyperopic?
Hyperopic

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

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!

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).

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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately)

How do radial cuts correct myopia?
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 to the peripheral cornea.
Incisional Corneal Refractive Surgery

**Refractive Surgery**

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

Imprecision in IOL calculations for cataract surgery

**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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

Hyperopic

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

'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.

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!

**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:

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.

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 to the peripheral cornea.
Refractive Surgery

Incisional Corneal Refractive Surgery

What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the optical zone.

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:

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 IOL power that pops out of those calcs.

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

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 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 to the peripheral cornea.
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.)

Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

Hyperopic

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

‘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

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!

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:

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 IOL power that pops out of those calcs

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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?

Quite deep—about 85-90% corneal thickness

How many cuts are made?

Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?

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 to the peripheral cornea.
**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.)

Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the optical zone.

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

Hyperopic

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

‘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

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!

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:

- **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 IOL power that pops out of those calcs

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

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

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 to the peripheral cornea.
Refractive Surgery

What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.) Imprecision in IOL calculations for cataract surgery

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 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 regarding the relationship between corneal curvature at these two areas. The trouble is, these assumptions were developed with virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the optical zone.

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:

1. 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 over-refraction; then

2. Perform the calcs via several of the 3rd or 4th generation calc formula, then using the highest IOL power that pops out of those calcs.

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

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

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?
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 to the peripheral cornea.

Incisional Corneal Refractive Surgery

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

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

What is IRIS-fixated Intraocular Pseudophakic Phakic IOL?

Refractive lens exchange (RLE)

Incisional Corneal Refractive Surgery

PRK
LASEK
CK
ICRS
CXL
LASIK
SMILE
Epi-LASIK
RK
AK
LRI

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 bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.
Incisional Corneal Refractive Surgery

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

Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone. 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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:

1. 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
2. Perform the calcs via several of the 3rd or 4th generation IOL calculation formula, then using the highest IOL power that pops out of those calcs.

With regard to the IOL itself, can a toric and/or a multifocal lens be used in a post RK eye?
A toric lens can be considered, but multifocals should be avoided in these eyes.

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?
Over 40!

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?
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 to the peripheral cornea.

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

Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

If standard IOL calculations are applied to an RK eye, will the resulting ‘refractive surprise’ be myopic, or hyperopic?
Hyperopic

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

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!
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 of the cornea bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep--about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

What is the other main problem associated with RK? (Hint: It's not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery.

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

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.

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

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!
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 of the cornea bounded by a 3-4 mm diameter ring).

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.

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

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 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 to the peripheral cornea.

What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery

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 power is determined. Standard techniques (keratometry; Placido-disc topography) don’t measure central power directly; rather, they measure power at 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

Two words: other

How

Quite

How

Usually

How

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 to the peripheral cornea.
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 of the cornea bounded by a 3-4 mm diameter ring). These incisions are quite deep, about 85-90% of corneal thickness. Usually 4 or 8 incisions are made, occasionally 16, but not more than 32 (although this has been done, unfortunately).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery.

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 power is determined.

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

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

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!
What is the other main problem associated with RK? (Hint: It’s not usually encountered until the pt is 60+ years old.)

Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

Hyperopic

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

‘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.

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!

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 bounded by a 3-4 mm diameter ring). Quite deep—about 85-90% corneal thickness. Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately).

How do radial cuts correct myopia?

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 to the peripheral cornea.

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 feasible, on the steep meridian.
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.)

Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

Hyperopic

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

‘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

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!

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 bounded by a 3-4 mm diameter ring)

How deep are these cuts made?

Quite deep—about 85-90% corneal thickness

How many cuts are made?

Usually 4 or 8, occasionally 16, hopefully not 32 (although it’s been done, unfortunately)

How do radial cuts correct myopia?

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 to the peripheral cornea.

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 feasible, on the steep meridian

Hyperopic
Incisional Corneal Refractive Surgery

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 of the cornea bounded by a 3-4 mm diameter ring).

How deep are these cuts made?
Quite deep—about 85-90% corneal thickness.

How many cuts are made?
Usually 4 or 8, occasionally 16, hopefully not 32 (although it's been done, unfortunately).

How do radial cuts correct myopia?
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 to the peripheral cornea.

What is the other main problem associated with RK? (Hint: It's not usually encountered until the pt is 60+ years old.)
Imprecision in IOL calculations for cataract surgery.

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone; thus, the assumptions simply no longer apply.

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

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

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!

If the RK cornea possesses significant astigmatism, where should the cataract incision be placed?
If feasible, on the steep meridian.

If so, why?
To avoid ‘crossing’ the RK incisions.
Incisional Corneal Refractive Surgery

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

Imprecision in IOL calculations for cataract surgery

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 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 virgin corneas. By inducing central corneal flattening, RK radically alters the relationship between central power and power at the 3-4 mm optical zone.

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'

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?
Over 40!

The radial incisions in RK extend from the peripheral cornea to the central 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.

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

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 curved, whereas transverse keratotomy incisions are straight.
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**)

---

**Incisional Corneal Refractive Surgery**

- **Intraocular**
  - Pseudophakic
  - Phakic IOL

- **Corneal**
  - Incisional
  - Laser
  - Other
    - RK
    - AK
    - LRI
    - PRK
    - LASEK
    - Epi-LASIK
    - LASIK
    - SMILE
    - CK
    - SAI
    - CRI
    - CXL
    - ICRS
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Corneal

Incisional

Laser

Other

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?
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 **curved**, whereas transverse keratotomy incisions are **straight**.
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 **curved**, whereas transverse keratotomy incisions are **straight**.
In what fundamental way does AK differ from LRI?

In terms of the location of the incision—AK incisions are made ~7 mm from the center of the cornea, whereas LRI incisions are made at the limbus.
In what fundamental way does AK differ from LRI? In terms of the location of the incision--AK incisions are made ~3.5 mm from the center of the cornea, whereas LRI incisions are made at the limbus.
In what fundamental way does AK differ from LRI? In terms of the location of the incision--AK incisions are made ~3.5 mm from the center of the cornea, whereas LRI incisions are made at the limbus.
AK incisions

LR incisions
Incisional Corneal Refractive Surgery

Refractive Surgery

Intraocular

Pseudophakic

Phakic IOL

Corneal

Incisional

Laser

Other

Incisional

RK

AK

LRI

In what fundamental way does AK differ from LRI?
In terms of the location of the incision--AK incisions are made ~3.5 mm from the center of the cornea, whereas LRI incisions are made at the limbus (Note that this results in an AK optical zone of ~7 mm)
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
      - LRI
    - Laser
      - PRK
      - LASEK
      - Epi-LASIK
      - LASIK
      - SMILE
    - Other
      - CK
      - SAI
      - CRI
      - CXL
      - ICRS
Incisional Corneal Refractive Surgery

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

Incisional
- RK
- AK
- LRI

Corneal
- Laser
  - PRK
  - LASEK
  - Epi-LASIK
  - LASIK
  - SMILE
- Other
  - CK
  - SAI
  - CRI
  - CXL
  - ICRS

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

What is the typical context in which AKs are used? To correct post-penetrating keratoplasty astigmatism
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

Incisional

Laser

Other

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?
The steep

Are they performed singularly, or in pairs?
In pairs, on opposite sides of the cornea

Incisional Corneal Refractive Surgery

Refractive Surgery

Corneal

Incisional

Laser

Other

RK

AK

LRI

PRK

LASEK

Epi-LASIK

LASIK

SMILE

CK

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? In 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

What is the typical context in which AKs are used? To correct post-penetrating keratoplasty astigmatism
Incisional Corneal Refractive Surgery

Refractive Surgery

Corneal

Incisional

Laser

Other

PRK
LASEK
Epi-LASIK
LASIK
SMILE

CK
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?
In pairs, on opposite sides of the cornea

Which is more commonly used today?
LRIs, by a mile

RK
AK
LRI
Incisional Corneal Refractive Surgery

Refractive Surgery

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?  
In 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

To correct post-penetrating keratoplasty astigmatism

Other

CK
SAI
CRI
CXL
ICRS
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?
The steep

Are they performed singularly, or in pairs?
In 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

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?
In 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

What is the typical context in which AKs are used?
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?
The steep

Are they performed singularly, or in pairs?
In 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

What is the typical context in which AKs are used?
To correct post-penetrating keratoplasty astigmatism
Incisional Corneal Refractive Surgery

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?
In 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

What is the typical context in which AKs are used?
To correct post-penetrating keratoplasty astigmatism
Incisional Corneal Refractive Surgery

Refractive Surgery

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?
In 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

What is the typical context in which AKs are used?
To correct post-penetrating keratoplasty astigmatism

In treating post-PK astigmatism, where are the AK incisions placed?
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? In 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

What is the typical context in which AKs are used? To correct post-penetrating keratoplasty astigmatism

In treating post-PK astigmatism, where are the AK incisions placed? Either in the host vs. donor cornea, or the PK incision itself
Incisional Corneal Refractive Surgery

Refractive Surgery

Corneal

Incisional

Laser

Other

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?
In 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

What is the typical context in which AKs are used?
To correct post-penetrating keratoplasty astigmatism

In treating post-PK astigmatism, where are the AK incisions placed?
Either in the donor cornea, or the PK incision itself
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? In 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.

What is the typical context in which AKs are used? To correct post-penetrating keratoplasty astigmatism.

In treating post-PK astigmatism, where are the AK incisions placed? Either in the donor cornea, or the PK incision itself.

Why not place the incisions in the host bed?
Incisional Corneal Refractive Surgery

Refractive Surgery

Corneal

Incisional Corneal Refractive Surgery

Incisional

- RK
- AK
- LRI

Laser

- PRK
- LASEK
- Epi-LASIK
- LASIK

Other

- CK
- SAI
- CRI
- CXL
- CRS

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? In 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

What is the typical context in which AKs are used? To correct post-penetrating keratoplasty astigmatism

In treating post-PK astigmatism, where are the AK incisions placed? Either in the donor cornea, or the PK incision itself

Why not place the incisions in the host bed? Because doing so produces only a negligible effect on the astigmatism
What was the typical context in which transverse keratotomy was used?

Transverse keratotomy
What was the typical context in which transverse keratotomy was used? It was used in conjunction with RK to correct the astigmatic portion of the RK pt's refractive error. As RK fell out of favor, transverse keratotomy fell with it.
When AK and LRI incisions placed on the steep meridian of the cornea, what effect do they have on that meridian’s steepness?

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

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

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

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

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

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

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

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

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

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

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

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

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

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (ie, the opposite meridian)?
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (ie, the opposite meridian)? They steepen it.
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (i.e., the opposite meridian)? They steepen it.

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

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (ie, the opposite meridian)? They steepen it.

What is the name for the phenomenon of incisions producing steepening in the opposite meridian? Coupling.
Corneal Coupling Effect

Before Corneal Incisions

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

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

After Corneal Incisions
MRx -1.50 spherical
Spherical Equivalent -1.50
K 44.00x090 / 44.00x180

Coupling
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (i.e., the opposite meridian)? 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?

In this context, what is the coupling ratio?
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (i.e., the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (i.e., the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

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

- >1?
- <1?
- =1?
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (i.e., the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

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

>1? There is a hyperopic shift

<1? There is a myopic shift

=1? The SE is unchanged
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (ie, the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

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

>1? There is a hyperopic shift

<1? There is a myopic shift

=1? The SE is unchanged

What is the most important factor in determining the coupling ratio of an AK/LRI procedure?

The procedure itself. Specifically, the LRI procedure essentially always produces a ratio of 1.0, whereas results with the AK procedure are more variable.

With respect to AK, what factors influence the coupling ratio?

--The length of the incisions
--The depth of the incisions
--The size of the optical axis
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (ie, the opposite meridian)?
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?
It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

What is the effect of the incisions on the spherical equivalent (SE) of the eye if the coupling ratio is…
>1? There is a hyperopic shift
<1? There is a myopic shift
=1? The SE is unchanged

What is the most important factor in determining the coupling ratio of an AK/LRI procedure?
The procedure itself. Specifically, the AK procedure essentially always produces a ratio of 1.0, whereas results with the LRI procedure are more variable (but usually ~1.0).
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (i.e., the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

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

>1? There is a hyperopic shift
<1? There is a myopic shift
=1? The SE is unchanged.

What is the most important factor in determining the coupling ratio of an AK/LRI procedure? The procedure itself. Specifically, the LRI procedure essentially always produces a ratio of 1.0, whereas results with the AK procedure are more variable (but usually ~1.0).
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (ie, the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

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

>1? There is a hyperopic shift

<1? There is a myopic shift

=1? The SE is unchanged

What is the most important factor in determining the coupling ratio of an AK/LRI procedure? The procedure itself. Specifically, the LRI procedure essentially always produces a ratio of 1.0, whereas results with the AK procedure are more variable (but usually ~1.0).

With respect to AK, what factors influence the coupling ratio?

--

--
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (i.e., the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

What is the effect of the incisions on the spherical equivalent (SE) of the eye if the coupling ratio is... >1? There is a hyperopic shift
<1? There is a myopic shift
=1? The SE is unchanged

What is the most important factor in determining the coupling ratio of an AK/LRI procedure? The procedure itself. Specifically, the LRI procedure essentially always produces a ratio of 1.0, whereas results with the AK procedure are more variable (but usually ~1.0).

With respect to AK, what factors influence the coupling ratio? --The length of the incisions
--The depth of the incisions
--The size of the two words
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.

What effect (if any) does placement of AK or LRI incisions have on the steepness of the meridian 90 degrees away (ie, the opposite meridian)? 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? It is an index of the relative flattening and steepening caused by the incisions. It is defined as the amount of flattening (in diopters) divided by the amount of steepening (again, in diopters).

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

>1? There is a hyperopic shift
<1? There is a myopic shift
=1? The SE is unchanged

What is the most important factor in determining the coupling ratio of an AK/LRI procedure? The procedure itself. Specifically, the LRI procedure essentially always produces a ratio of 1.0, whereas results with the AK procedure are more variable (but usually ~1.0).

With respect to AK, what factors influence the coupling ratio?
--The length of the incisions
--The depth of the incisions
--The size of the optical zone
With regard to AKs and LRIs, what factors influence their effectiveness?

- The depth of the incisions

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography? It depends. AKs performed as a stand-alone procedure should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism. 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.

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°.
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

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°.
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

Incisional Corneal Refractive Surgery

Corneal

Incisional

Laser

Other

AK

PRK

LASEK

Epi-LASIK

LASIK

SMILE

LRI

CXL

ICRS

Other

PRK

SAI

CRI

CK

CXL

ICRS
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

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

Corneal

Incisional

Laser

PRK
LASEK
Epi-LASIK
LASIK
SMILE

Other

CK
SAI
CRI
CXL
ICRS

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

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

What is the relationship between pt age and the effect of a given LRI or AK incision?
The older v younger pt, the greater will be the effect.

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°.
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

What is the relationship between pt age and the effect of a given LRI or AK incision?
The older the pt, the greater will be the effect.

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°.

Incisional Corneal 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

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

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°.
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

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.

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

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.
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

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.

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°.
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

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

Corneal

Incisional

- RK
- AK
- LRI

Laser

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

Other

- CK
- SAI
- CRI
- CXL
- ICRS
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

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

AK

LRI

RK

Corneal

Laser

Other

PRK

LASEK

Epi-LASIK

LASIK

SMILE

CK

SAI

CRI

CXL

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

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

-- The depth of the incisions

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—cyclo torsion. 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°.
With regard to **AKs and LRIIs**, what factors influence their effectiveness?

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

Because they are more centrally located, **AK incisions** have a greater effect centrally vs. peripherally.

---The depth of the incisions

---The number of incisions

---The length of the incisions

---Pt age

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

It depends. **AKs performed as a stand-alone procedure** should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism. 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.

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°.

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

Because they are more centrally located, **AK incisions** have a greater effect centrally vs. peripherally.
Incisional Corneal Refractive Surgery

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

**Speaking of effectiveness…** For a given incision length and depth, which has more effect on astigmatism: LRIIs, or AKs? Because they are more centrally located, AK incisions have a greater effect.

-- The depth of the incisions

---

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°.

---

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

Because they are more centrally located, AK incisions have a greater effect.
Astigmatic keratotomy effect as a function of incision location

Central Incisions = More Flattening

Peripheral Incisions = Less Flattening

This cornea still has 1 diopter of residual astigmatism.

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

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

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°.
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

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography?
It depends. AKs performed as a stand-alone procedure should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism.

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°.
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

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography? It depends. AKs performed as a stand-alone procedure should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism. 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.

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 15o. 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 15o.
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

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography?
It depends. AKs performed as a stand-alone procedure should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism. 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.

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

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography?
It depends. AKs performed as a stand-alone procedure should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism.
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.

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

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography? It depends. AKs performed as a stand-alone procedure should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism. 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.

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

Why seated upright?
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

Should incisional correction of astigmatism be based on a manifest refraction, or corneal topography?
It depends. AKs performed as a stand-alone procedure should be based on the manifest refraction, so as to offset both corneal and lenticular astigmatism.
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.

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°.