FEMTOSECOND LASER

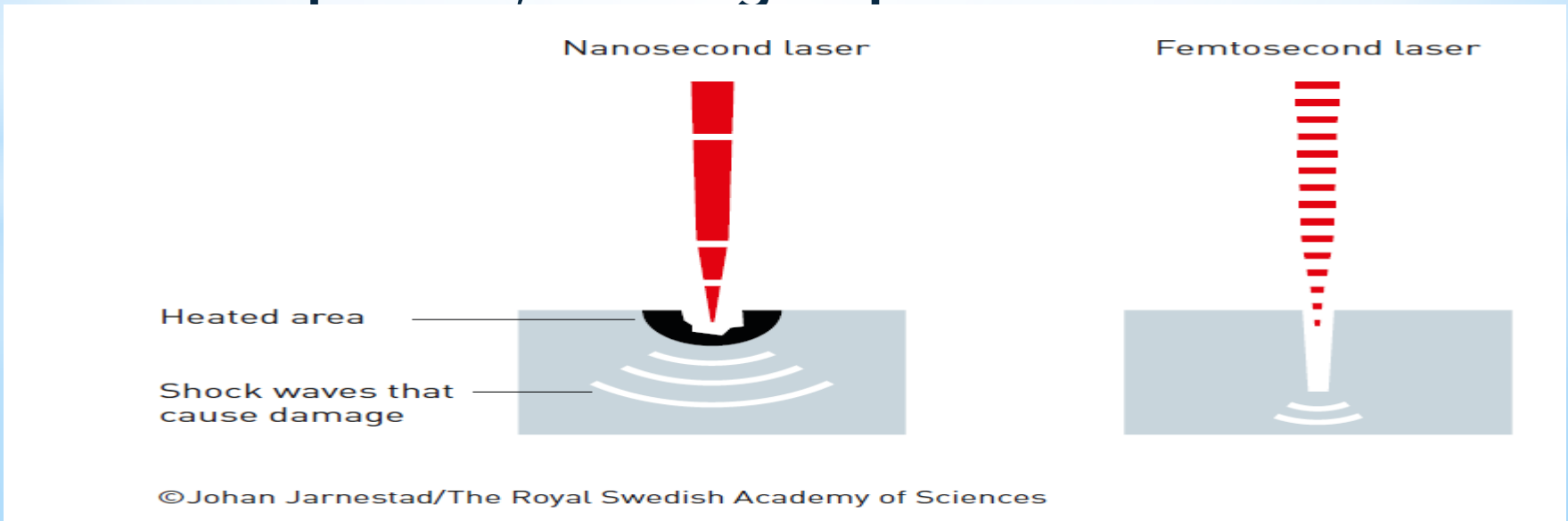
1 fs = 10^{-15} s

How FSL Act?

- **Femtosecond lasers focus the energy on a very short time (duration) scale within a single laser pulse (ultrashort pulse).**

- **These lasers work by creating an extremely short, focused pulse of energy, causing formation of a cavitation bubble.**

- **The femtosecond laser disrupts stromal tissue through a process known as photoionization. Targeted tissue is vaporized, creating a split where a cut would**



Benefit of FSL

1. Reduced incidence of flap complications like buttonholes, free caps, irregular cuts etc with standardized corneal incisions
2. perfectly centered and round capsulorhexis
3. lens nucleus fragmentation even in eyes with hard cataracts.

Applications of FSL in Ophthalmology

1- Refractive surgery

a) FemtoSMILE (Small Incision Lenticule Extraction)

b) Femtolasik

2- **keratoplasty.**

a) Full thickness

b) Lamellar keratoplasty.

3- Cataract

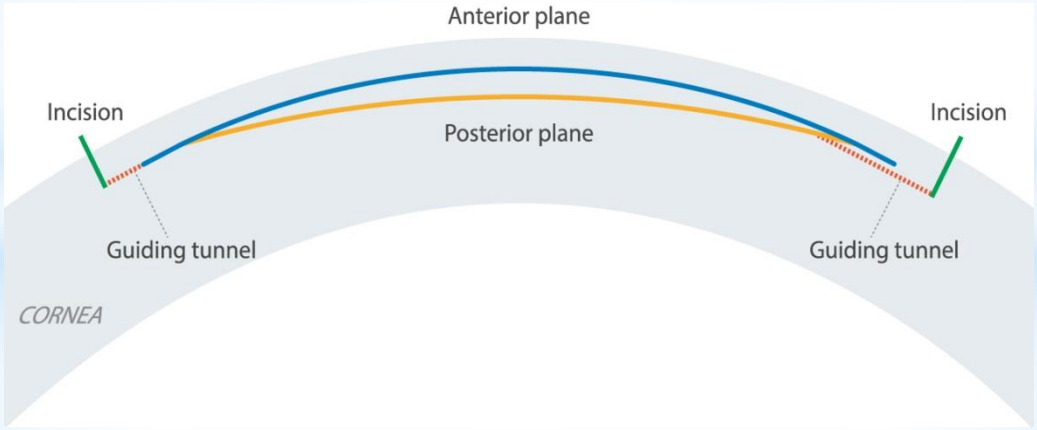
a) Capsulorrheuxis.

b) Lens nucleus fragmentation

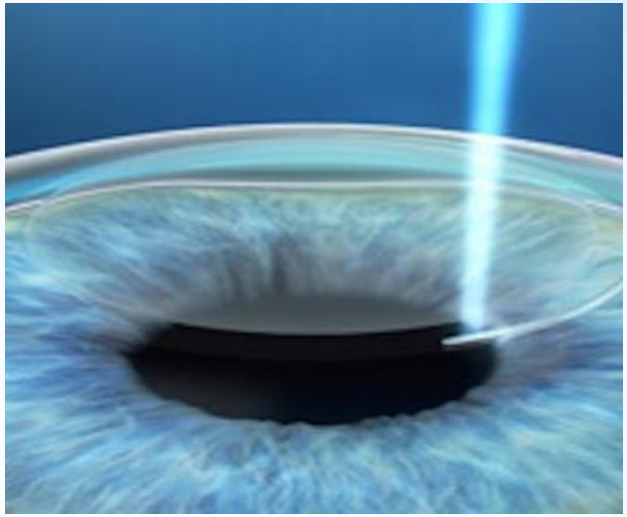
FemtoSMILE

SMILE is running on a femtosecond laser to reshape the cornea. This femtosecond laser is an extremely short-pulsed, near infrared laser often

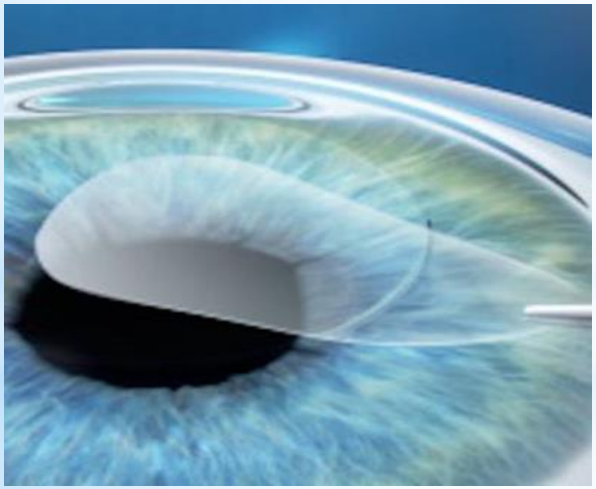
It takes less than 30 seconds for the laser to create a small lens-shaped piece of corneal tissue (called the lenticule) inside the cornea. The surgeon then removes the lenticule through a small incision outer part of the eye. This reshapes the cornea and corrects the refractive error.



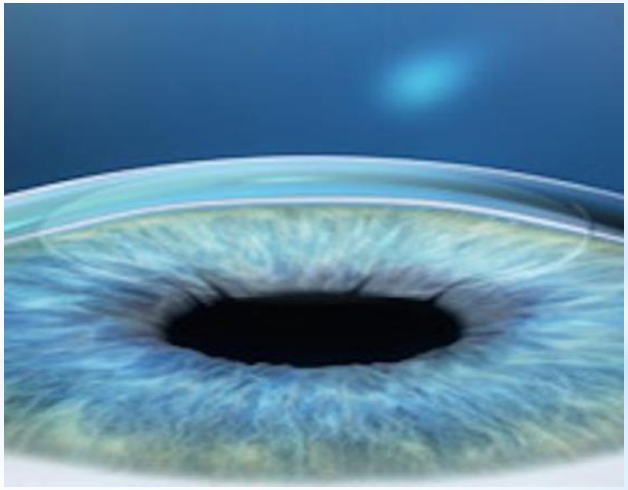
Numbing the eye



Creating the lenticule and the incision



Removing the lenticule



Correcting the refractive error

Benefits

* Femtosecond lasers are designed to harmlessly pass through the upper layers of the cornea, to create the lenticule only at a specific sublayer inside the cornea, which means:

- With an incision smaller than 4mm on the eye surface, SMILE supports a minimally invasive procedure .
- The outer layer of the cornea doesn’t have to be removed.
- Corneal nerves stimulating the tear glands are less affected and are still able to help keep the eye lubricated. Side effects, such as dry eye syndrome, are rare after SMILE.
- Maintaining the corneal stability is supported, because the entire upper layers of the cornea are virtually unaffected.

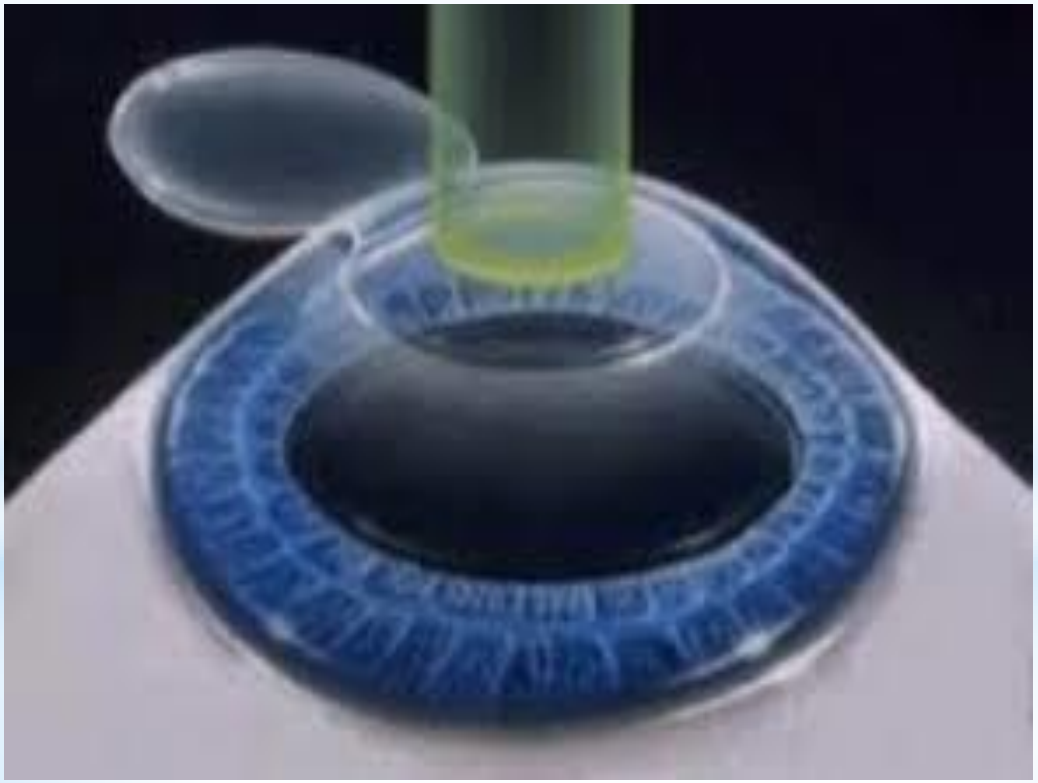
Recommendations

Faster recovery and more safer than other refractive surgery

Pre & post operative same as LASIK

FemtoLASIK

Is the same as LASIK except that the flap is created by femtosacond laser instead of mechanical microkeratom.



Difference between FemtoLASIK & LASIK

1. In Lasik surgery, the microkeratome performs a **corneal tissue cut**, while, with the FemtoLasik, the femtosecond laser separates the layers of the tissue without making an incision. The **absence of cuts in the FemtoLasik** provides **BEST** and fairer **speed boat tour** recovery.
2. The femtosecond laser acts very **exact**, **accurate** y **controlled**. Blade cuts depend on the surgeon's maneuver and there is a risk that the cut will not be accurate.
3. The femtosecond laser used in the FemtoLasik offers **lower risk of corneal ectasia** than Lasik surgery.

4. Thanks to the accuracy of the femtosecond laser **thinner corneas can be operated with FemtoLasik surgery**.

5. Patients operated with FemtoLasik have **lower risk of requiring a touch up in the future**.

6. The probability of Dry Eye after surgery is **minor with FemtoLasik** that under the Lasik technique.

7. The **results and visual recovery is better in patients operated with FemtoLasik** than with Lasik.