Refractive lenticule extraction, is it replacing the ablation lasers?

Dr. Sandip Mitra MD FRCSEd Cornea and Refractive Fellow (RVEEH, Melbourne, AUS)
Consultant Ophthalmologist,
Alzahra Private Hospitals, UAE

I have no financial interest in any of the products mentioned in this presentation.
Let's look at the present picture in UAE

- In 2014 we had 1 centre in Dubai and 1 in Sharjah performing Relex smile and today we have 2 centres in Dubai, 2 centres in Abu Dhabi and 2 centres in Sharjah, where Relex Smile is being performed and as I speak we will have more people interested in performing Relex Smile.

- Why is it getting popular and what are the benefits of this procedure and has it completely replaced LASIK or FEMTO-LASIK
SMILE or LASIK or PRK

- Answer is at the moment both the procedures are required but lenticule extraction is definitely started to dominate the market because of the negative publicity and complications encountered during LASIK or PRK procedures.
Problems of making flap during Lasik surgery

Making a flap depends on K reading and may lead to free cap, button hole and incomplete flap.

Improper closure of flap leads to edge lifts and micro or macro striae and also epithelial in growth.
Dry eye problem in LASIK patients

Because of Flap in LASIK the corneal nerves are cut and patient suffers from Dry eyes for months and sometimes for life long specially in our weather condition in UAE. Incidence of dry eyes in LASIK patients is 20-30% in various studies for a period of 6 months or more whereas in Smile it is almost negligible.
Lenticule extraction idea came from the work of Jose Barraquer

1916 to 1998 Dr Jose Barraquer Spanish Ophthalmologist

In 1963 Jose Barraquer started with Keratomileusis
Relex new invention by Carl Zeiss Visumax

- In 2007 the first trial was started using a 200 Hz solid state Femto second laser machine and the time to cut the lenticule use to take 60 seconds and there was slight delay upto 1 week for full vision recovery.

- Now we have a faster 500 Hz Femto second laser machine, where in the surgery is performed in 30 to 40 seconds.

- There is no harmful gases, no burning smell for the patient, no tissue ablation, full biomechanical strength is preserved and one machine is used to complete the surgery.
Our vision and mission:
Establish ReLEx as the next generation premium refractive treatment.

**Evolution of laser surgery**

- **PRK**
  - LASEK
  - Epi-LASIK

- **LASIK**
  - Standard LASIK
  - Femto-LASIK

- **ReLEx**
  - flex Femtosecond Lenticule Extraction
  - smile Small Incision Lenticule Extraction
What is the major concept? Tissue is removed and preserved (Relex smile) rather than ablated and lost (LASIK)

| Intrastromal femtosecond laser lenticule cut | Tissue removal instead of ablation |

Lenticule removed can be used for various procedures like correcting presbyopia, treating keratoconus by increasing the thickness and performing CXL, reversing the effect of correction
ReLEx®

**ReLEx® flex**
- Femtosecond Lenticule Extraction

**ReLEx® smile**
- Small Incision Lenticule Extraction
Flapless bladeless
Relex Smile

• No problems of making flap
• AND
• faster procedure with single platform of femto second laser is definitely better treatment choice for me than LASIK
ReLEx smile is flapless and minimally invasive
Small incision - big advantage

Advantages of the new **flapless** ReLEx smile procedure:

- Minimally invasive surgery: **80%** less side cut
  (compared to LASIK) **30%** less cap cut
- Preserves integrity of upper corneal layers, less dry eyes

Confocal microscopy images of corneal nerve regeneration

Return of corneal sensation
Suction pressure during LASIK

The mean IOP rise during the LASIK procedure is between 80 - 120 mm Hg and this can cause damage to the Optic nerve (e.g. glaucoma, Vascular optic neuropathy and rarely RD). Whereas in Smile it is ACURVATION RATHER THAN APLANNATION with a smoothly designed contact lens and the IOP rise is between 30 - 60 mm Hg.
Decentration during the LASIK treatment

- Centration during the LASIK treatment depends on the eye tracker and patient cooperation specially in higher treatment cases, DIFFICULT IN PATIENTS WITH NYSTAGMUS.

- In Smile the treatment is fast and once the docking is done the eye does not move and centration is maintained. The time duration for -0.50 D and -12 D is same 30 sec.
Night glare and halos

- Even after wavefront treatment the optical zone in LASIK treatment can be made upto 6 mm leading to glare and halos in larger pupil patients.

- In Smile the treatment can be done upto 7.5 mm, therefore lesser risk of night glare even in larger diameter pupil.
why to use two platform for treatment?

• LASIK involves Femtosecond or microkeratome and Eximer machine which prolongs the surgical time

• Smile is performed on a single platform, thereby reduces the operation time and more comfortable for the patient.
Lasik treatment is more tissue hungry than Smile

- In Lasik for 6 mm Optical zone each diopter of correction requires 12 micron of ablation and it is more if the wavefront treatment is planned.

- In Smile for 6 mm OZ each diopter of correction requires 8 micron of tissue removal and more tissue is preserved.
why should i damage the most stronger layers of cornea

- Lasik and thin flap lasik is performed in the superficial layers of the cornea, which in rabbit models have shown to be the most stronger part of the cornea and resist ectasia.

- whereas in smile the treatment is performed in the deeper layers beyond the 130 micron, thereby preserving the integrity of the stronger superficial layers and also the corneal nerves.
Resuming activity after LASIK

Most of the sports activity after LASIK are resumed after 1 month compared to Smile where in one can start everything from day 1. Rarely flap dislocation are noted after 6 - 7 years after eye trauma.
Relex smile vs Lasik

- no flap, the risk for flap complications are not there
- Bigger lenticule size and centred on the visual axis leads to better night vision and less of glare at night
- faster procedure than LASIK and same duration for all sizes of refractive error, therefore minimises the effect of room temperature and humidity on the outcome of laser treatment.
Relex smile procedure for correcting post corneal graft astigmatism

Post corneal transplant refraction of -4ds/-6cyl at 20 deg
20/25
Not tolerating RGP lens
Anisometropia with glasses
Wanted some solution

Performed Relex Smile procedure for
-4 ds and -5 cyl at 20 deg
And immediate picture on your right

UCVA day 1 20/40 with error of -1 cyl at 20 deg
BCVA of 20/25
• Visual outcomes are the level of advanced LASIK/PRK or even better
• Convincing stability with almost no regression over time

* Controlled multicenter study, 3 study sites
Day 1 survey of 600 patients who underwent Relex Smile at Alzahra Hospital since 2014

1. How was your experience with the surgery?
   - 99% said excellent with no discomfort

2. Did you feel any pain during the procedure?
   - 98% said no, 2% mild

3. How was your eye sight on day 1 after the surgery?
   - 98% said very good both near and far sight and could drive on day 1

4. How is the night vision?
   - 97% very good, 2% some glare and 1% moderate glare

5. When did you resume all activities?
   - 100% said from day 1.
• Excellent predictability, results very close to target refraction, even for high myopic corrections
• Refractive outcomes within ±0.5 D for 97% of eyes

* Controlled multicenter study, 3 study sites
Complication of poor technique in Relex smile

Using sharp dissector dissecting more than separating natural and artificial lenticule
Complications of Relex Smile

False passage created during lenticule separation
Faulty docking leading to De-centered Lenticule extraction and treatment
Diffuse Lamellar Keratitis after Relex Smile procedure due to retained foreign body in the lenticular space
Relex Smile limitations

- Difficult to perform in small refractive errors less than -1 diopter
- Not possible in hyperopic cases because of the lenticule profile which is thin at the centre and thick at the periphery leading to difficult lenticule extraction
- Correction not possible for error more than -12 D
- and astigmatism > 5 D
- no eye tracker
- no toric monitor
- no wavefront correction possible
- requires proper training
- re-treatment not standardised yet (possible smile over smile) or PRK or thin flap LASIK (circle profile software)
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