cTEN

Custom Trans-Epithelial No-touch

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History

- The idea of epithelial removal with the excimer laser is as old as excimer laser surgery itself, but has had problems with:
  - Large ablation volume (typically 3-5 times larger than the refractive ablation)
    - Long ablation time
    - Irregularity of the ablation surface
      - Lower predictability
  - VISX laser scrape
    - Not all of the epithelium removed by laser (the rest removed mechanically)
    - Max de-epithelialization diameter = 6 mm
    - Cannot be linked together with the refractive treatment

cTEN by iVIS

- 1,000 Hz iVIS laser (the “iRES”) removes the epithelium in only about 15 seconds
- All laser treatments typically complete in less than 30 seconds total: both epithelial removal and the custom refractive components
- Epithelial thickness is surgeon specified to 60 microns in virgin eyes and to 75 microns in secondary cases, or programmed as measured by Artemis or Visante

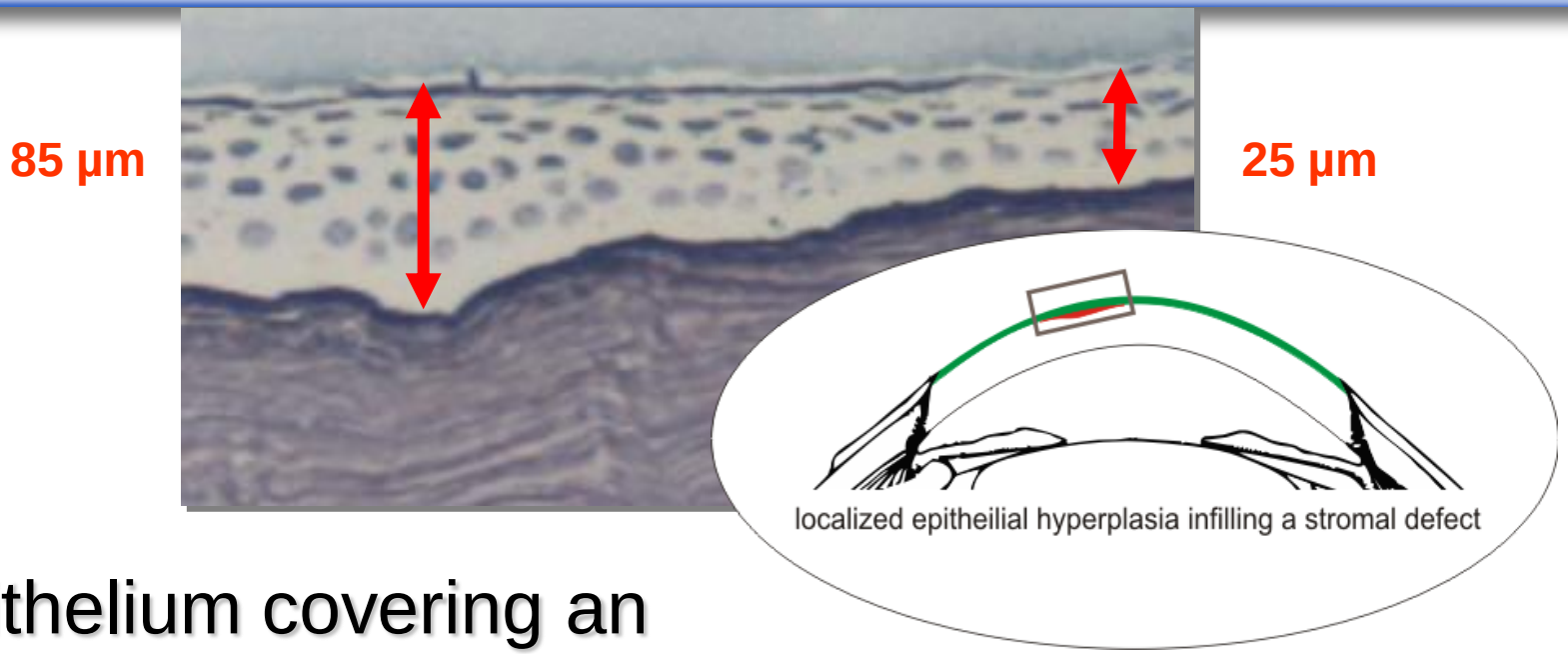
cTEN by iVIS

- Epithelial removal is programmed into a single uninterrupted ablation together with the customized refractive ablation
  - Epithelial ablation exactly fits the outer edges of the custom ablation to remove only the absolutely necessary amount of epithelium.
- Re-epithelialization is shorter by at least a day, compared to other types of surface ablations, due to lesser epithelial area removed, no mechanical or chemical trauma, and smooth gaussian shaped epithelium edges
  - Less discomfort
  - Faster visual recovery

cTEN by iVIS

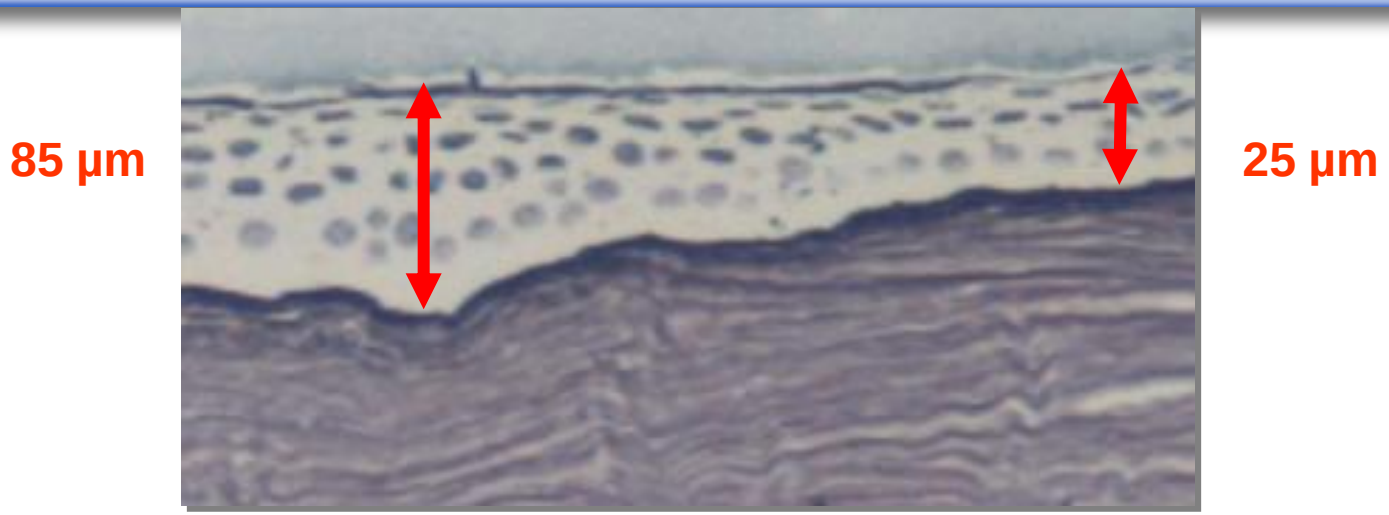
- Safety, efficacy and predictability in virgin eyes at least as good as with LASIK using any modern system
- Especially suitable for treatment of irregular astigmatism
  - cTEN is the only type of surface ablation immune to the effects of epithelial remodeling

Variability of epithelial thickness - Due to remodeling in irregular astigmatism (IA)



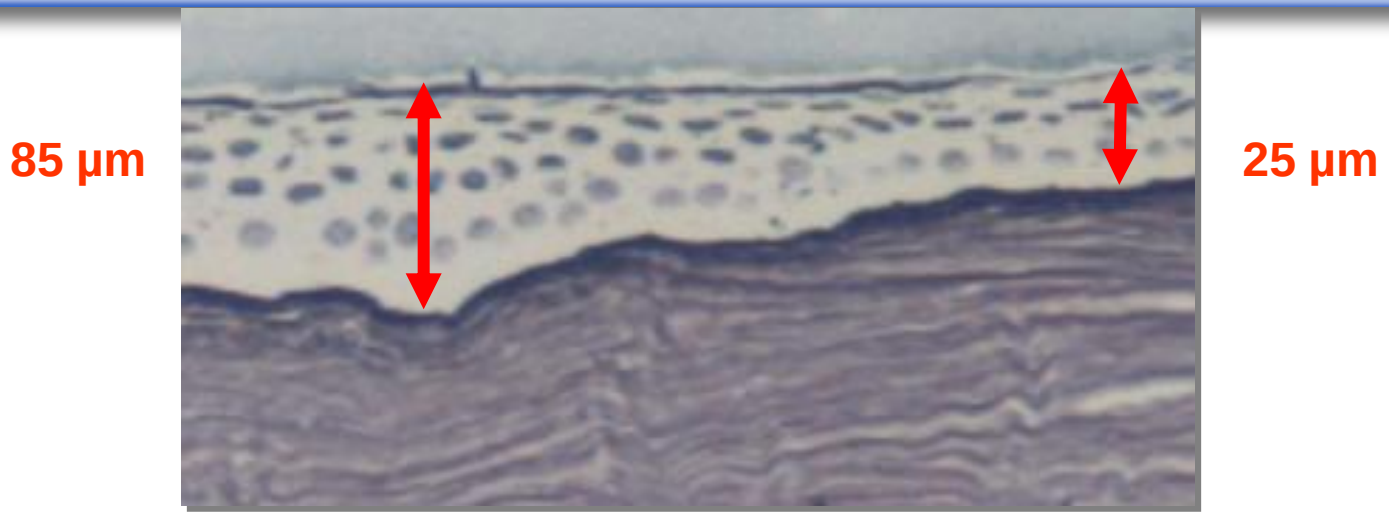
- Epithelium covering an irregular stroma has a smoothing / filling characteristic
  - Stromal surface under the epithelium is very different from the measured surface on which the CA is based

Variability of epithelial thickness - A problem in custom surface ablation



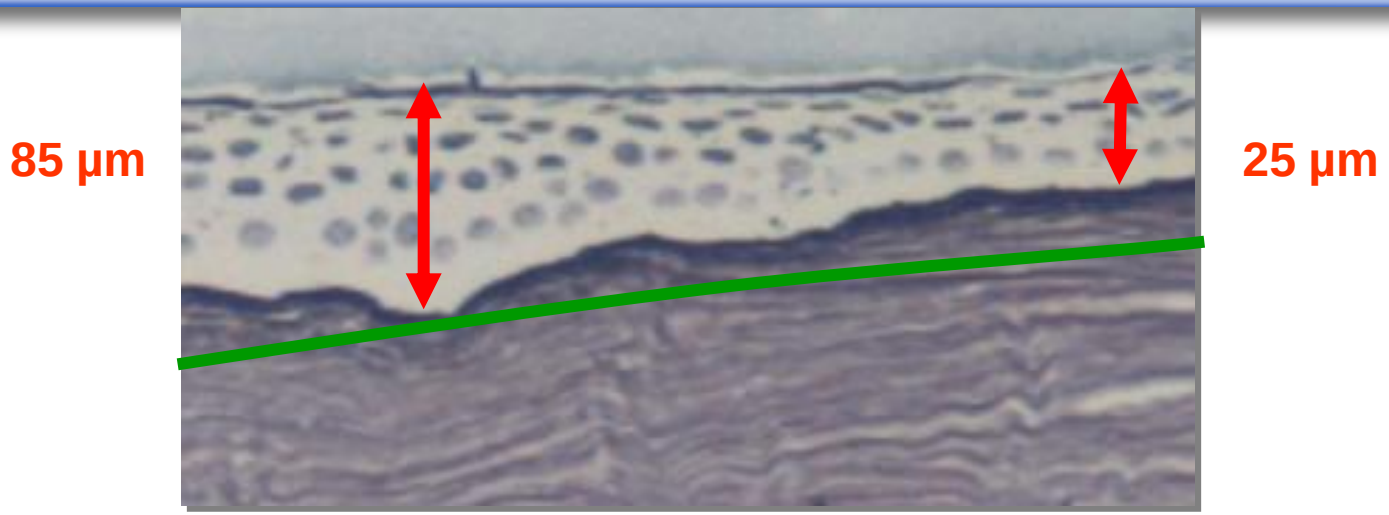
- If the epithelium is simply removed before the ablation (PRK, LASEK, EpiLASIK...), assuming the epithelium has uniform thickness
  - The ablation may induce irregularities by the same irregular depth of the epithelium! (60+ µm)

Solution A:



- The epithelium **may be** mapped (Artemis, hi-res OCT?) and subtracted from the custom ablation plan.
  - This requires highly repeatable and accurate epithelium measurements

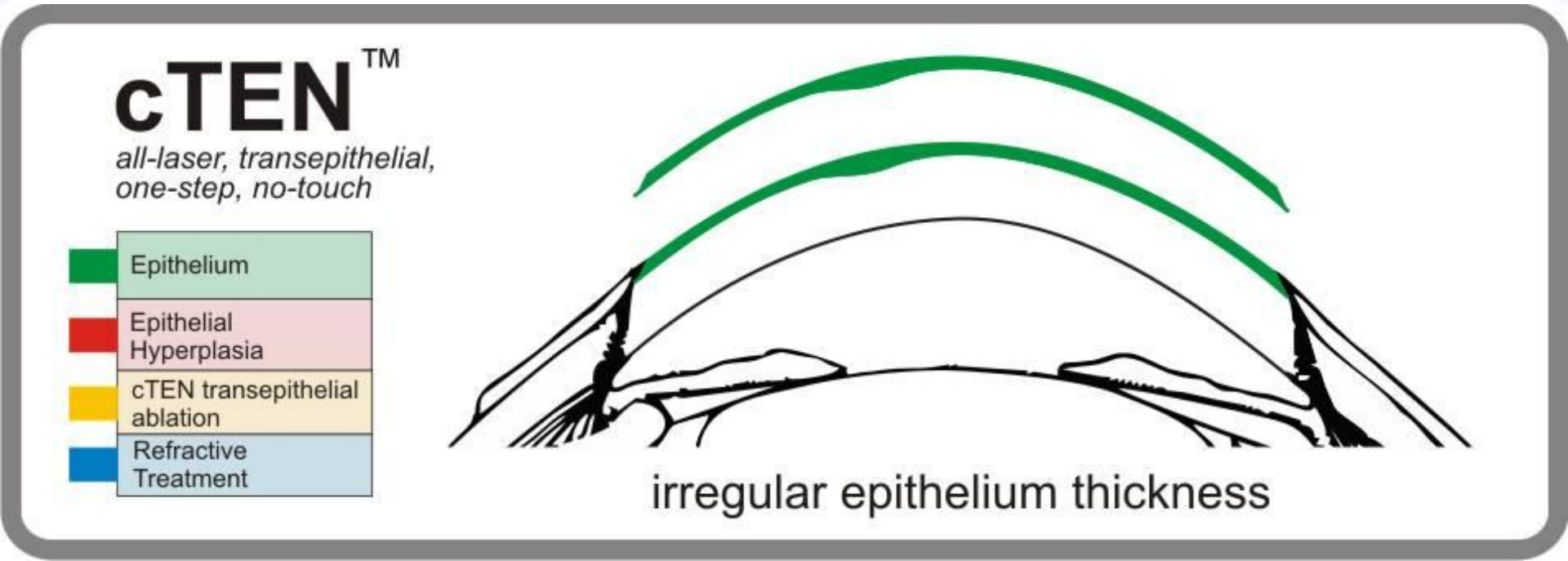
Solution B:



- Epithelium may be an **integral part of a single ablation that includes epithelial removal**
- The planned postoperative surface is moved below the epithelium into the stroma

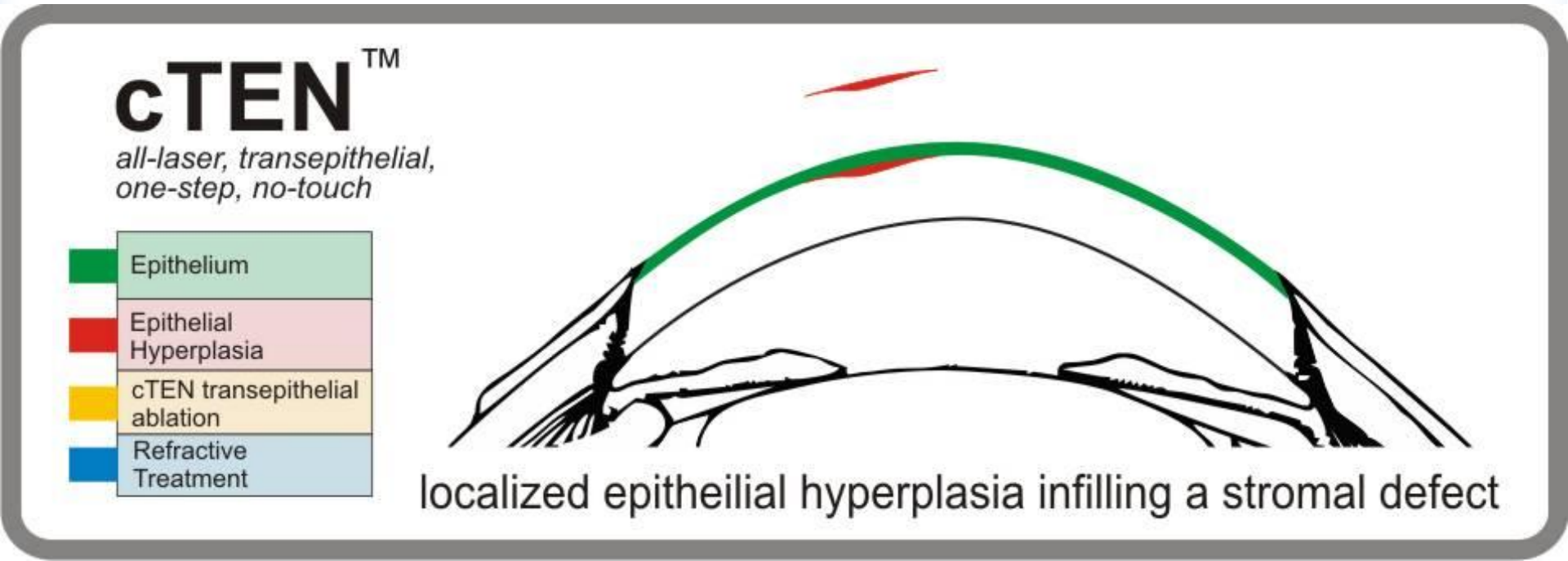
Irregular / variable epithelial thickness is common with IA

- The ablation profile is designed assuming that the epithelium is a planar surface / uniformly thick / no refractive contribution.
  - Epithelium tends to mend / compensate for irregularities.



If variable epithelial thickness is not accounted for (after epithelial removal)

- The refractive contribution of irregular thickess epithelium, if debrided normally, will result in a "shadow" of this irregularity ablated into the stroma
  - **Only cTEN treats the measured corneal surface (includes LASIK!)**



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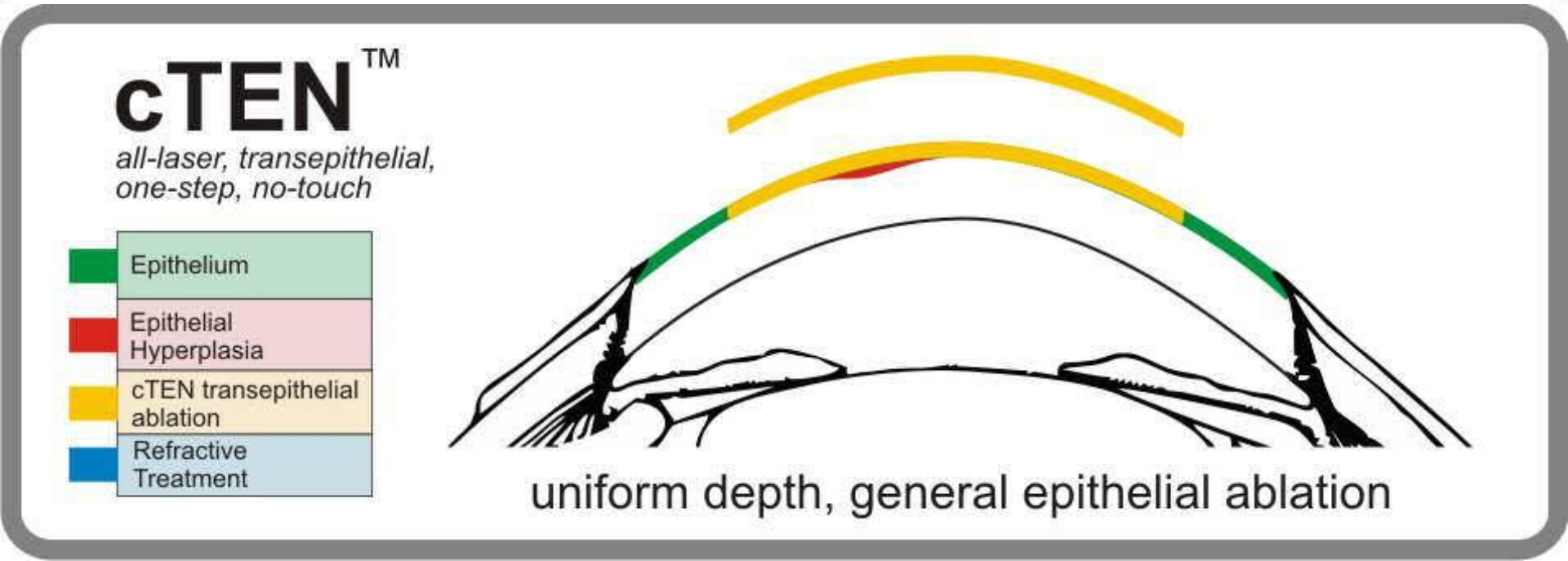
- The desired corneal surface is “moved” 60 to 90 microns below the measured surface so that it is generally below the epithelium-stroma interface.



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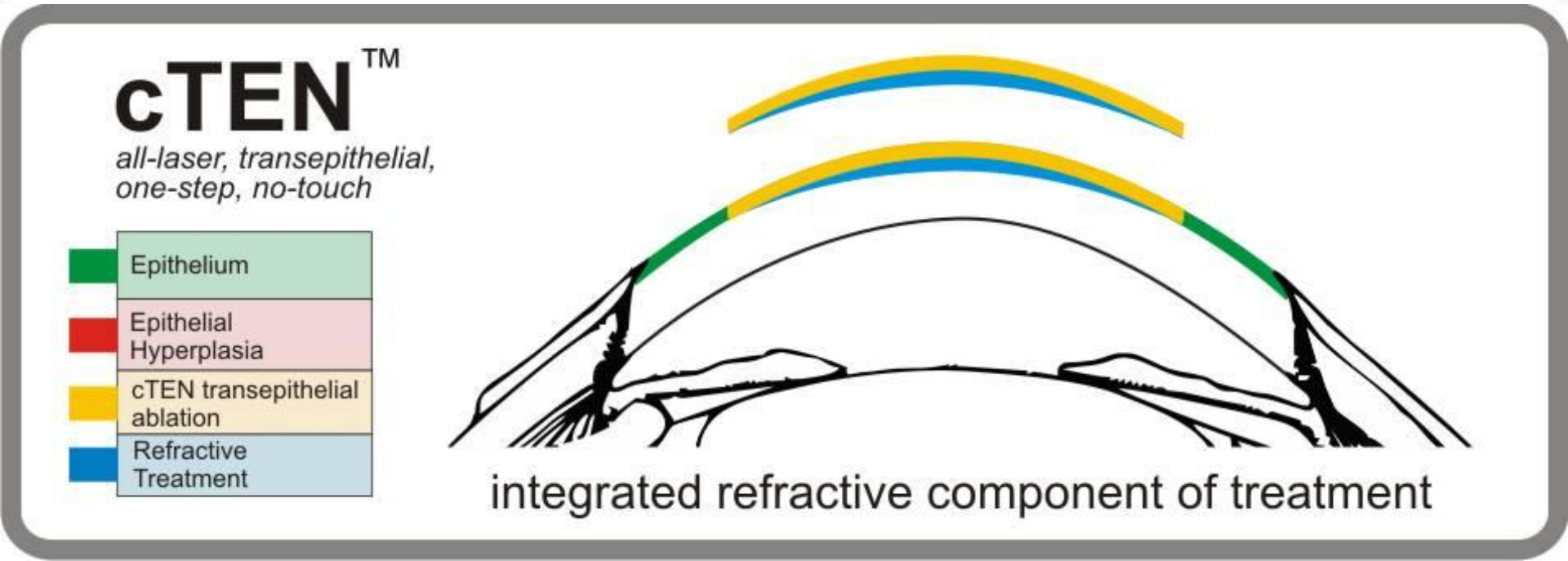
- The custom refractive component seamlessly complements the epitheilium removal.
  - The sum of the 60 to 90 µm lamellar ablation + TGA creates the desired surface below the deepest epithelial point



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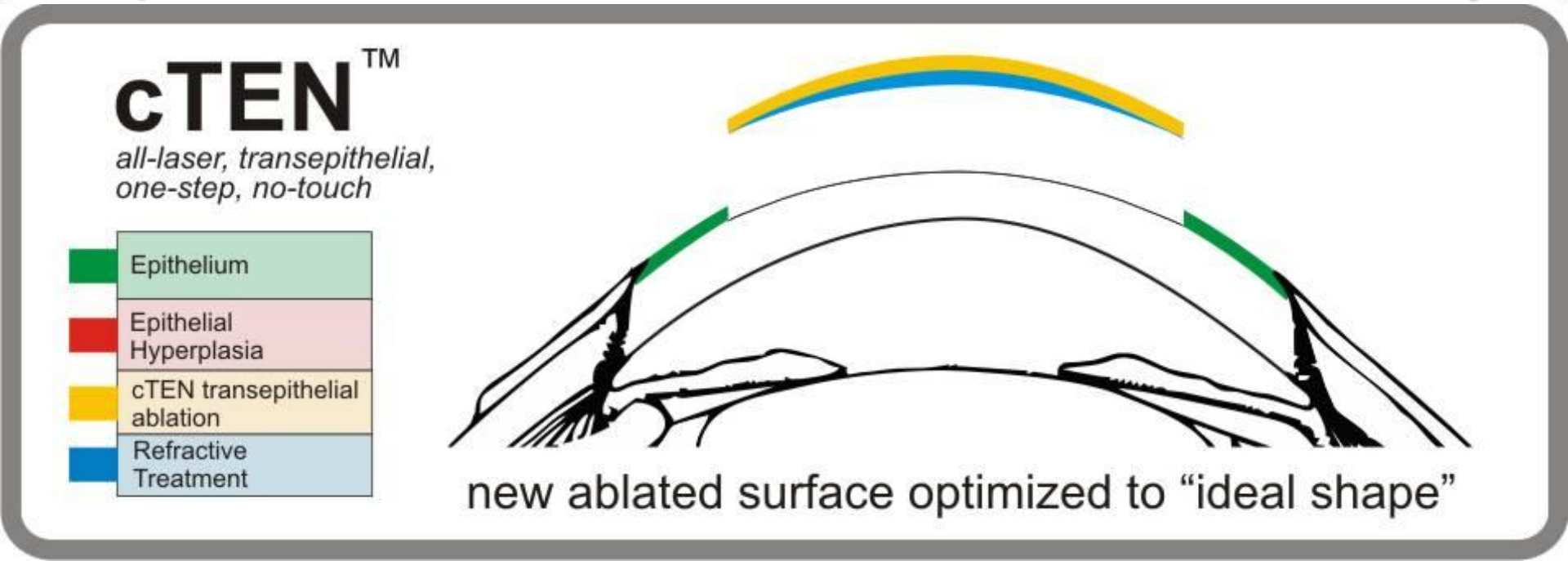
- The new “Ideal Aconic Surface” is fully integrated into the stroma, with a refractive area just sufficient to cover the “Ideal Pupil” and a variable width, constant slope transition zone. cTEN area fits this area exactly.



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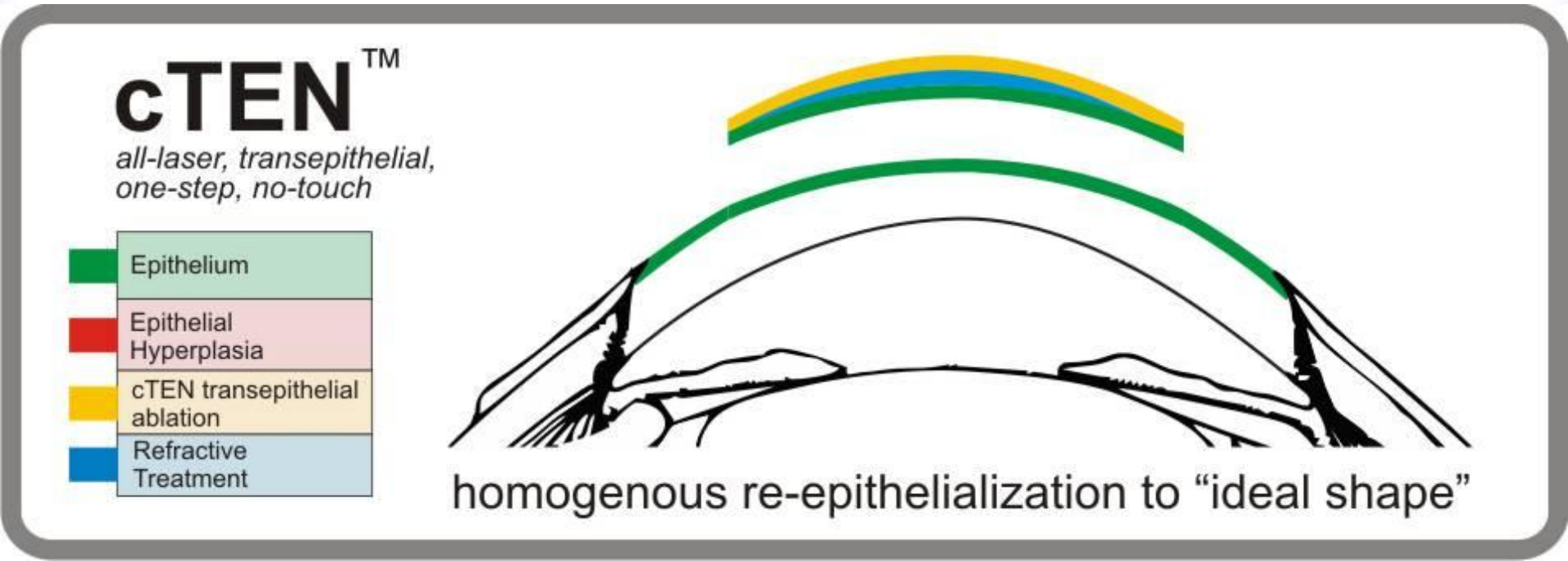
- The “high fidelity” ablation results in a new, highly regular Ideal Shape, with high tendency for the epithelium to remain constant thickness.



Conclusions

- **cTEN :**
  - Quick and comfortable treatment for patients and the surgeon
  - Quicker and faster re-epithelialization and less postoperative discomfort compared to other types of surface ablation
  - The only way to eliminate the unknown of epithelial remodeling in surface ablation of irregular astigmatism