



Università di Palermo  
Dipartimento di Biomedicina Sperimentale  
e Neuroscienze Cliniche  
Sezione di Oftalmologia  
Responsabile: Prof. Salvatore Cillino



## **DSAEK**

*Modalità di inserimento del lembo e  
nostra esperienza con inseritore  
a camera chiusa*

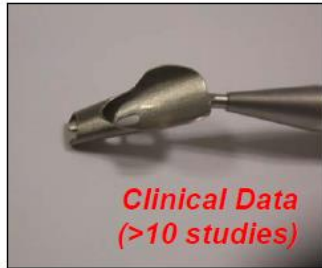
L. L. Ferraro, C. Novara,  
D. Schifano, M. Castellucci, S. Cillino

Giardini Naxos,  
17 Aprile 2015

# CHERATOPLASTICA ENDOTELIALE

- ◉ *Queratoplastia laminar posterior* – Barraquer 1956
- ◉ *Posterior lamellar keratoplasty (PLK)* – Melles 1999
- ◉ *Deep Lamellar Endothelial Keratoplasty (DLEK)* – Terry 2001
- ◉ *Descemets Stripping Endothelial Keratoplasty (DSEK)* – Price 2005
- ◉ *Descemets Stripping with Automated Endothelial Keratoplasty (DSAEK)* – Gorovoy 2006
- ◉ *Descemets Membrane Endothelial Keratoplasty (DMEK)* – Melles 2006
- ◉ *ULTRATHIN-DSAEK (UT-DSAEK)* – Busin 2012

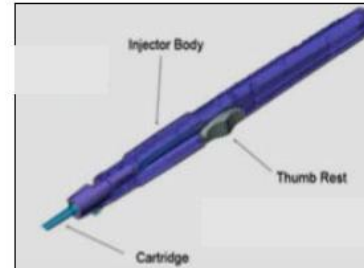
# DSAEK Injectors, Inserters, Glides



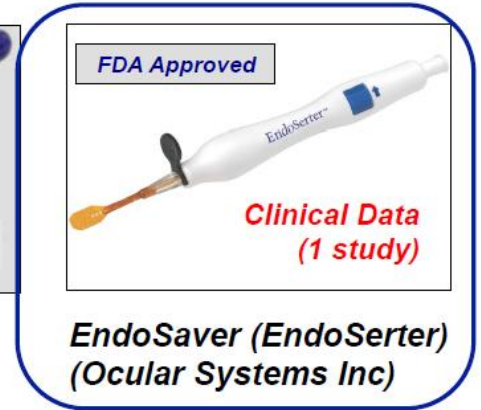
**Busin Glide  
(Moria)**



**Neusidl Corneal Inserter  
(NCI) (Fischer)**



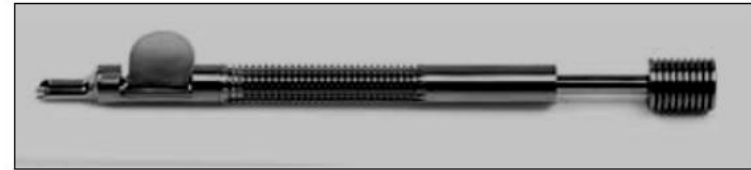
**EndoInjector  
(Keramed)**



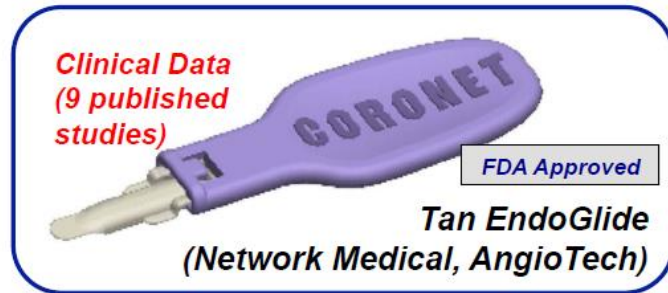
**EndoSaver (EndoSarter)  
(Ocular Systems Inc)**



**Al-Ghoul injector**



**Macaluso Sealing "Glide" (Janach)**



**Daya Endostar  
(Duckworth & Kent)**



**Rieck Glide(Geuder)**

# TECNICA PUSH IN

## PINZE (Goosey, Charlie, Kelman, Olga, MacPherson)

- Inizialmente alta ECL (endothelial cell loss)
  - > 6 m 37% (25%-54%)
  - > 12 m 41% (24%-61%)

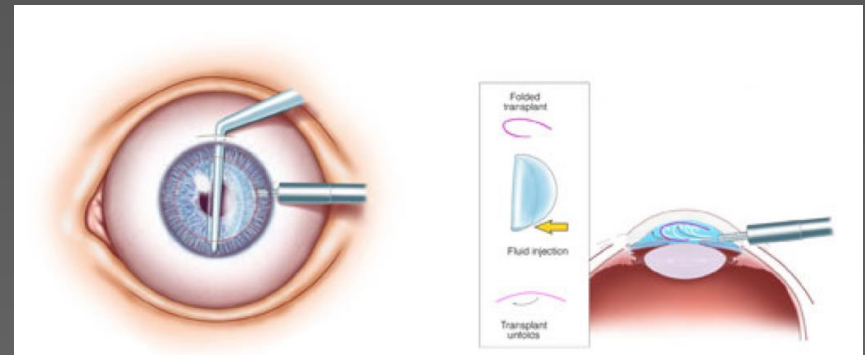


## Miglioramento tecnica:

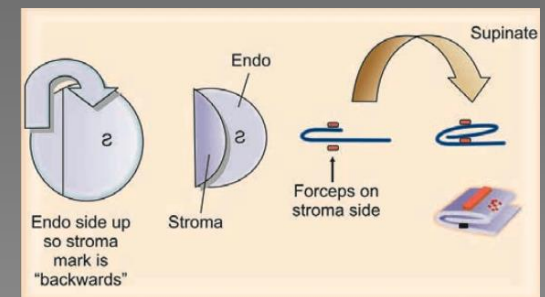
- Tecnica Taco/Burrito
- Pinze modificate



## Tecnica del Taco 60/40



## Tecnica del Burrito



# Pinza vs... "Device"

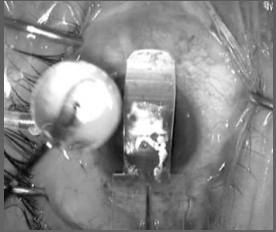
- ◉ Minima perdita endoteliale (ECL)
  - > ↓ Compressione nella ferita di accesso
  - > ↓ Manipolazione chirurgica
  - ↓ **Fallimento primario**
- ◉ Piccola incisione
- ◉ Corretto orientamento

# DEVICES

## Glides

Sheet Glide  
Busin Glide

Macaluso Glide  
Tan EndoGlide



## Injectors

Keramed's  
EndoInjector

Neusidl Corneal  
Inserter

Endosaver OSI



Ocular Systems Inc.

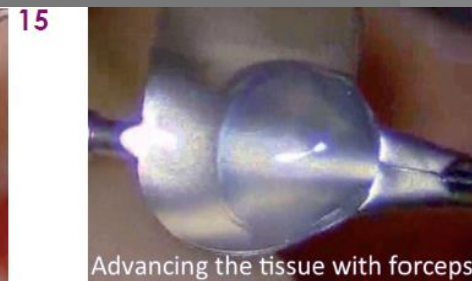
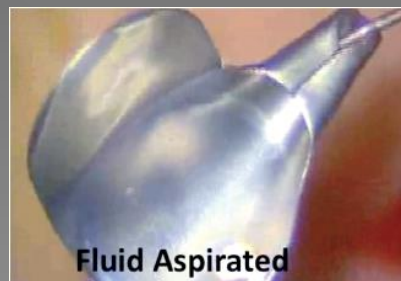
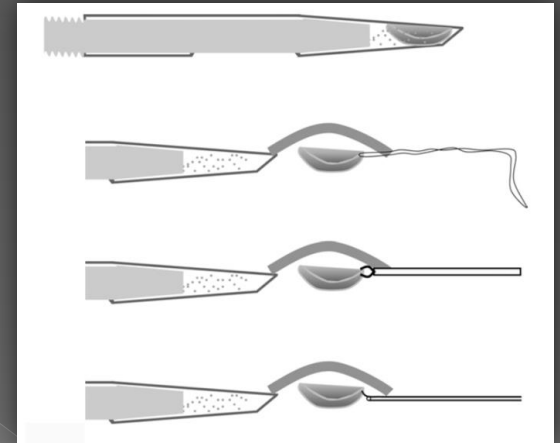
Top

ENDOSAVER™

# GLIDES

## Pull-Through Technique

- 2 incisioni: Incisione temporale e incisione a 180°
- Trazione con ago, sutura o pinza
- AC Mainer +/-



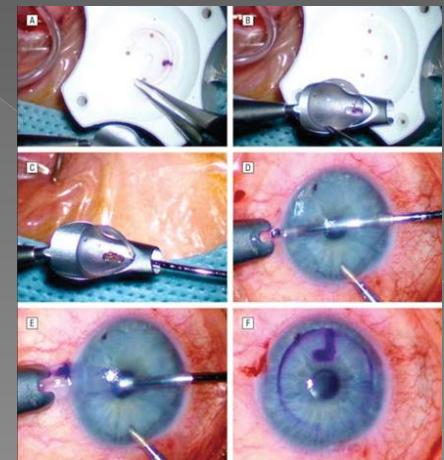
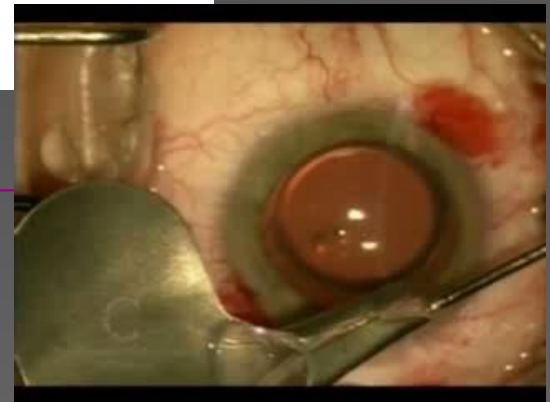
# BUSIN GLIDE

## A Modified Technique for Descemet Membrane Stripping Automated Endothelial Keratoplasty to Minimize Endothelial Cell Loss

Massimo Busin, MD; Priya R. Bhatt, MRCOphth; Vincenzo Scorcia, MD

ARCH OPHTHALMOL/VOL 126 (NO. 8), AUG 2008

- Incisione 3.2 – 5 mm
- Non sovrapposizione endoteliale (fino a  $\varnothing$  8.38 mm)
- +/- ACM
- Tecnica Pull & Push





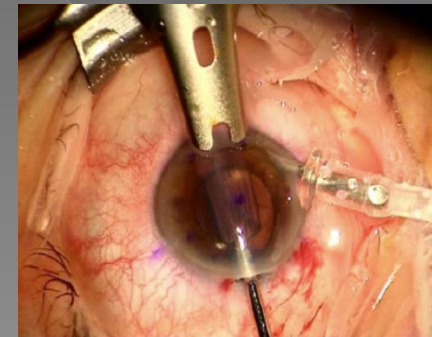
# BUSIN GLIDE

## A Modified Technique for Descemet Membrane Stripping Automated Endothelial Keratoplasty to Minimize Endothelial Cell Loss

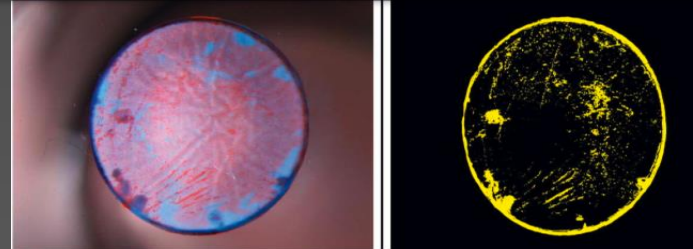
Massimo Busin, MD; Priya R. Bhatt, MRCOphth; Vincenzo Scorcia, MD

Table 2. Postoperative Data in Patients Undergoing Modified DSAEK

| Patient Data                    | Patient No. |      |      |      |      |      |      |      |      |      |
|---------------------------------|-------------|------|------|------|------|------|------|------|------|------|
|                                 | 1           | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |
|                                 | ECL         |      |      |      |      |      |      |      |      |      |
| Follow-up, mo                   |             |      |      |      |      |      |      |      |      |      |
| 6                               | 22.1        | 24.9 | 18.4 | 16.7 | 17.0 | 19.9 | 19.6 | 20.1 | 18.4 | 16.5 |
| 12                              | 22.5        | 28.2 | 24.2 | 20.2 | 25.1 | 22.6 | 26.0 | 18.9 | 25.2 | 21.8 |
| 18-24                           | 22.9        | 31.1 | 27.6 | 27.4 | 25.8 | 24.2 | 25.9 | 28.2 | 28.2 | 22.5 |
| Total Duration of Follow-up, mo | 24          | 24   | 24   | 24   | 22   | 22   | 22   | 22   | 18   | 18   |



# BUSIN GLIDE



| Endothelial Cell Loss | Eyes No. | Reference                            |
|-----------------------|----------|--------------------------------------|
| 25.0 % 6 mo.          | 37       | Bahar et al, Am J Ophthalmol 2009    |
| 47.5 % 6 mo.          | 30       | Gangwani et al, Am J Ophthalmol 2012 |

[Am J Ophthalmol](#). 2009 Feb;147(2):220-226.e1. doi: 10.1016/j.ajo.2008.08.029. Epub 2008 Oct 18.

## **Busin Guide vs Forceps for the Insertion of the Donor Lenticule in Descemet Stripping Automated Endothelial Keratoplasty.**

Bahar I<sup>1</sup>, Kaiserman I, Sansanayudh W, Levinger E, Rootman DS.

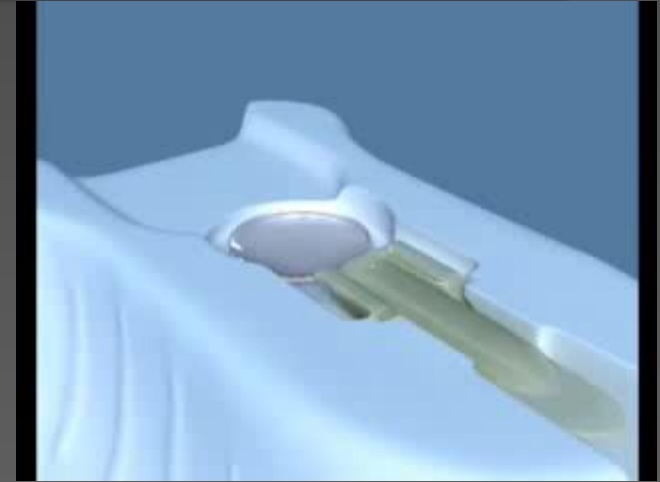
[Am J Ophthalmol](#). 2012 Jan;153(1):38-43.e1. doi: 10.1016/j.ajo.2011.06.013. Epub 2011 Sep 9.

## **A prospective study comparing EndoGlide and Busin glide insertion techniques in descemet stripping endothelial keratoplasty.**

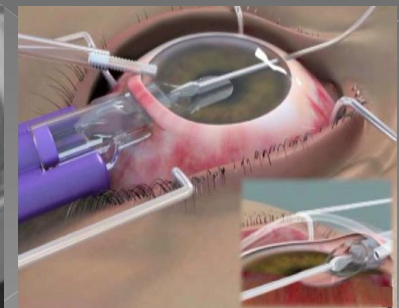
Gangwani V<sup>1</sup>, Obi A, Hollick EJ.

# TAN ENDOGLIDE

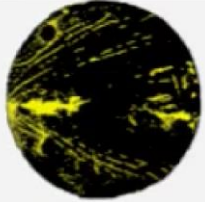
- Monouso
- Sezione interna a doppio avvolgimento
- Incisione 4-4.9 mm
- Non sovrapposizione endoteliale (fino a  $\varnothing$  10 mm)
- ACM+



**I sistemi a camera chiusa riducono il rischio di:**  
**COLLASSO CA, ESPULSIONE LENTICOLO, PROLASSO IRIDEO**



# TAN ENDOGLIDE



| Endothelial Cell Loss       | Eyes No. | Reference                         |
|-----------------------------|----------|-----------------------------------|
| 13.1% 6 mo.                 | 25       | Khor et al, AJO 2011              |
| 25.8% 6 mo.                 | 22       | Gangwani et al, AJO 2012          |
| 25.0% 6 mo.                 | 9        | Balidis et al, Transpl proc. 2012 |
| 13.5% 6 mo.<br>14.9% 12 mo. | 100      | Khor et al, AJO 2013              |

[Am J Ophthalmol. 2011 Feb;151\(2\):223-32.e2. doi: 10.1016/j.ajo.2010.08.027. Epub 2010 Dec 18.](#)

**Descemet stripping automated endothelial keratoplasty with a graft insertion device: surgical technique and early clinical results.**

Khor WB<sup>1</sup>, Mehta JS, Tan DT.

[Am J Ophthalmol. 2013 Oct;156\(4\):773-9. doi: 10.1016/j.ajo.2013.05.012. Epub 2013 Jul 4.](#)

**Descemet stripping automated endothelial keratoplasty with a donor insertion device: clinical results and complications in 100 eyes.**

Khor WB<sup>1</sup>, Han SB, Mehta JS, Tan DT.

[Am J Ophthalmol. 2012 Jan;153\(1\):38-43.e1. doi: 10.1016/j.ajo.2011.06.013. Epub 2011 Sep 9.](#)

**A prospective study comparing EndoGlide and Busin glide insertion techniques in descemet stripping endothelial keratoplasty.**

Gangwani V<sup>1</sup>, Obi A, Hollick EJ.

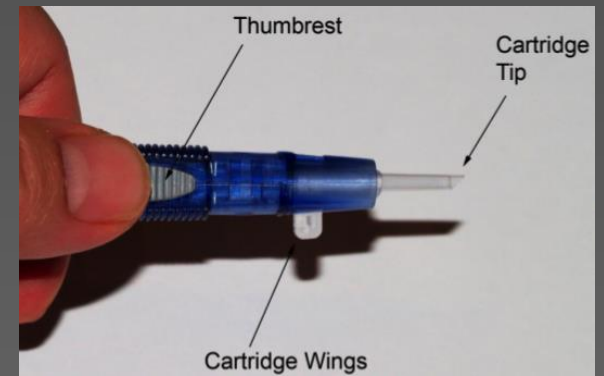
[Transplant Proc. 2012 Nov;44\(9\):2759-64. doi: 10.1016/j.transproceed.2012.09.006.](#)

**Descemet's stripping endothelial automated keratoplasty using Tan EndoGlide endothelium insertion system.**

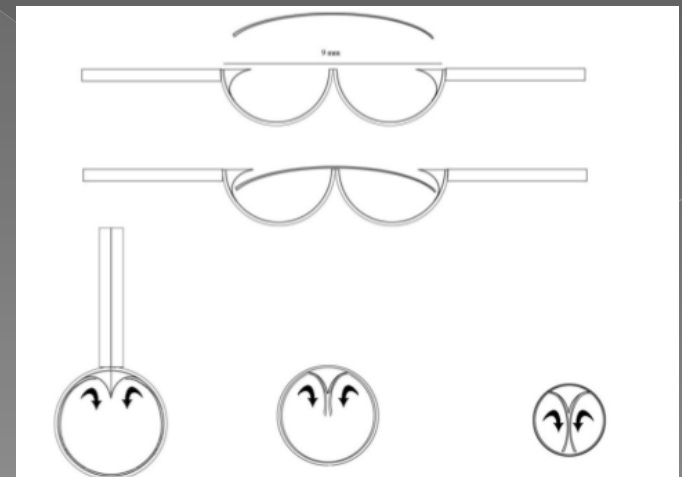
Balidis M<sup>1</sup>, Konidaris VE, Ioannidis G, Boboridis K.

# Keramed's EndoInjector

- IOL Cartridge modificato: rilievo centrale, lembo con doppia arricciatura
- Monouso
- Incisione 3.2mm
- ACM!



Dr. Shiuey riporta un 18% ECL a 6 m.



# Endoserter

# EndoInjector

## Iniettore monouso irrigante

- Piattaforma retraibile pieghevole  $\varnothing$ 8.5mm
- Non sovrapposizione endoteliale (fino a  $\varnothing$  7.75 mm)
- Incisione corneale 4 mm

- Incisione 5.2mm
- Lembo allocato su piattaforma pieghevole retraibile
- Non sovrapposizione endoteliale (fino a  $\varnothing$  8.75 mm)



# Endoserter

[Cornea](#). 2012 Jan;31(1):42-7. doi: 10.1097/ICO.0b013e3182120f9d.

**Small-incision Descemet stripping automated endothelial keratoplasty: a comparison of small-incision tissue injector and forceps techniques.**

Foster JB<sup>1</sup>, Swan KR, Vasan RA, Greven MA, Walter KA.

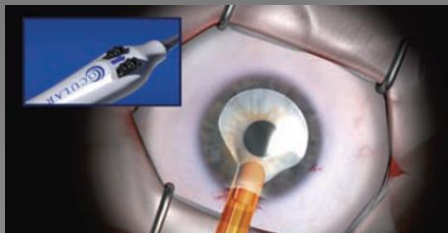
[Cornea](#). 2014 Jan;33(1):91-5. doi: 10.1097/ICO.0000000000000003.

**Endothelial damage with two DSAEK insertion techniques performed by a novice corneal surgeon in residency training: a comparative analysis.**

Riaz KM<sup>1</sup>, Grewal DS, Cervantes P, Basti S.



| Endothelial Cell Loss |          | Eyes No.            | References                  |
|-----------------------|----------|---------------------|-----------------------------|
| 28.3%                 | 6 mo.    | 70                  | Foster et al, Cornea 2012   |
| 12.3% ± 4.74%         | post- op | 10 (novice surgeon) | Riaz KM, et al, Cornea 2014 |



# EndoInjector

| Endothelial Cell Loss |        | Eyes No. | References                                  |
|-----------------------|--------|----------|---|
| 22%                   | 6 mo.  | 6        | Koyabashi et al, Ophth Surg Laser Imag 2012 |
| 31%                   | 12 mo. |          |   |
| 33%                   | 6 mo.  | 50       | Terry et al, Am J Ophthalmol 2013           |
| 16% (post-op)         |        | 10       | Davis-Boozer et all, Cornea 2013            |

[Am J Ophthalmol](#). 2013 Jul;156(1):61-68.e3. doi: 10.1016/j.ajo.2013.01.025. Epub 2013 Mar 19.

**Endothelial keratoplasty: prospective, randomized, masked clinical trial comparing an injector with forceps for tissue insertion.**

Terry MA<sup>1</sup>, Straiko MD, Goshe JM, Shamie N, Shah A, Alqudah AA, Davis-Boozer D.

[Ophthalmic Surg Lasers Imaging](#). 2012 Jul 1;43(4):311-8. doi: 10.3928/15428877-20120426-04. Epub 2012 May 3.

**Clinical results of the Neusidl Corneal Inserter(®), a new donor inserter for Descemet's stripping automated endothelial keratoplasty, for small Asian eyes.**

Kobayashi A<sup>1</sup>, Yokogawa H, Sugiyama K.

[Cornea](#). 2013 Apr;32(4):479-82. doi: 10.1097/ICO.0b013e318274a72b.

**In vitro evaluation of endothelial cell loss using the Neusidl Corneal Inserter.**

Davis-Boozer D<sup>1</sup>, Terry MA, Greiner MA, Holiman J, Saad HA, Alqudah AA, Li JY.



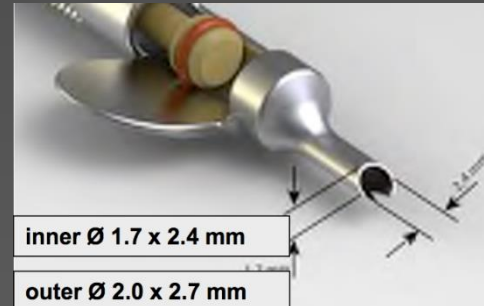


# Macaluso Glide

Closed-chamber pulling-injection system for donor graft insertion in endothelial keratoplasty

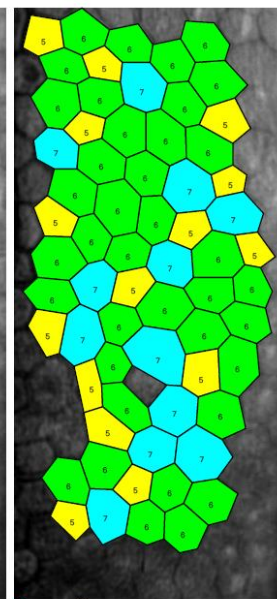
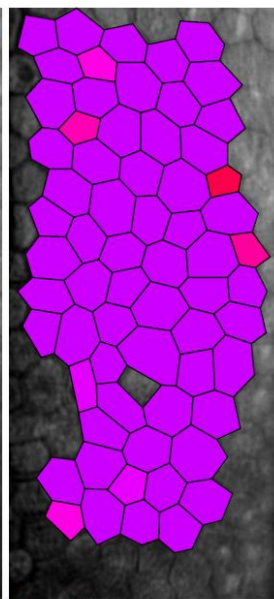
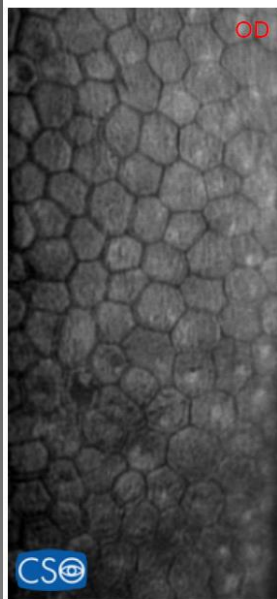
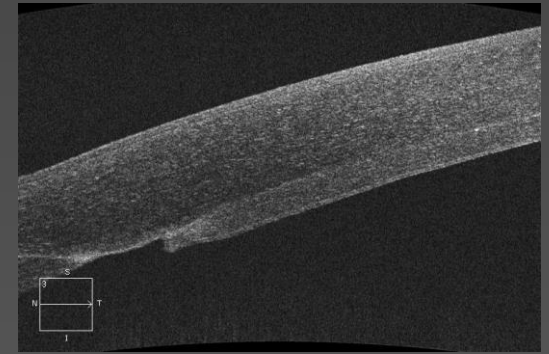
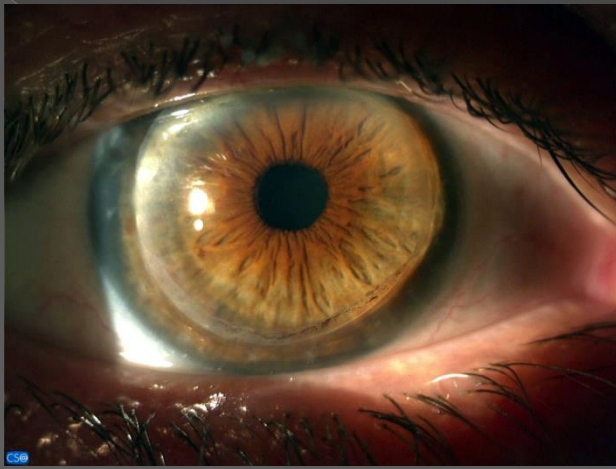
Claudio Macaluso, MD

*J Cataract Refract Surg* 2008; 34:353–356

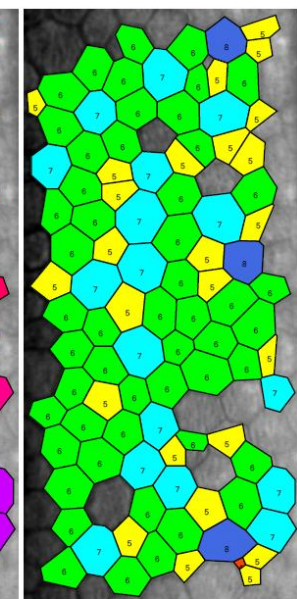
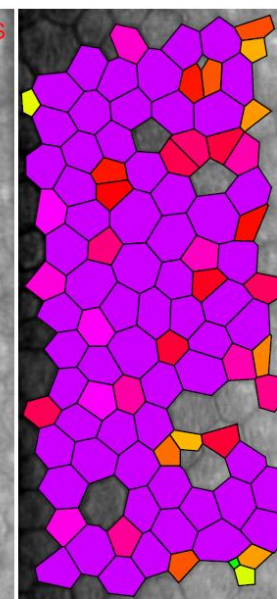
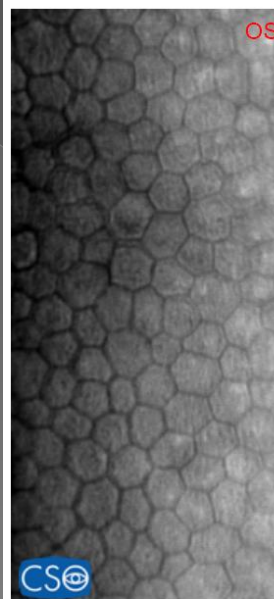
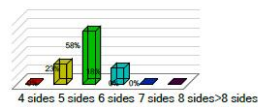
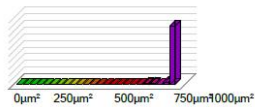


• Incisione 3.5 mm

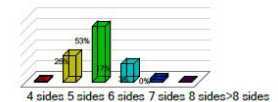
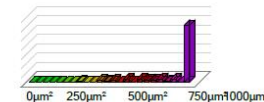


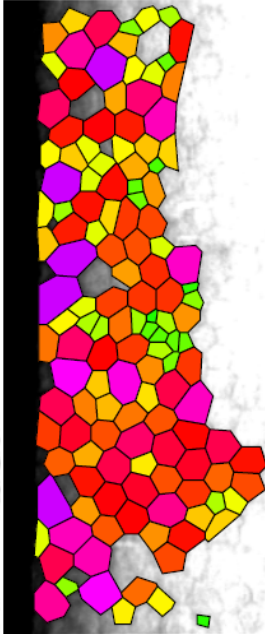
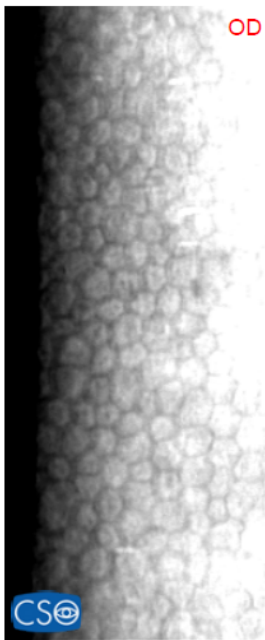
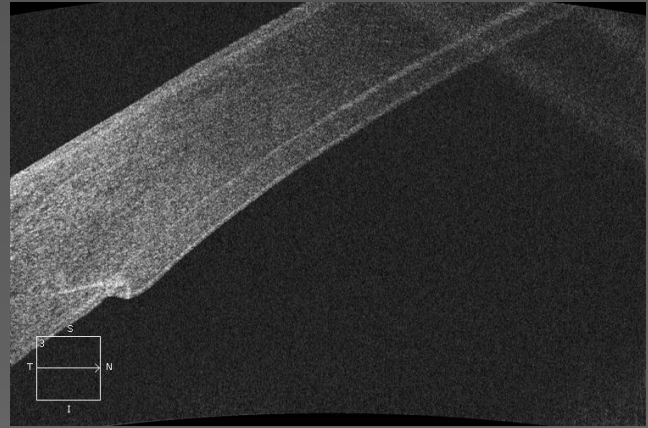
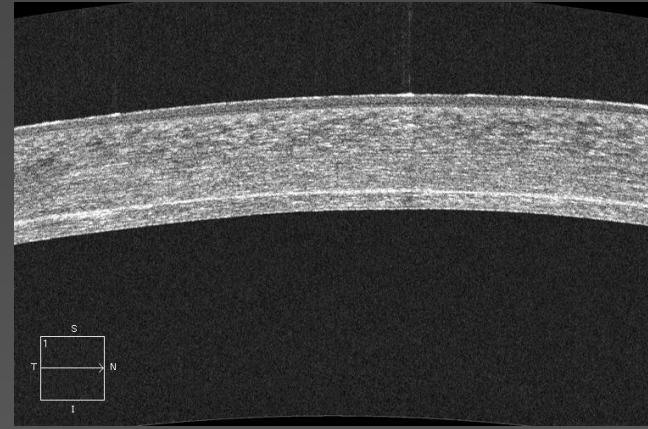
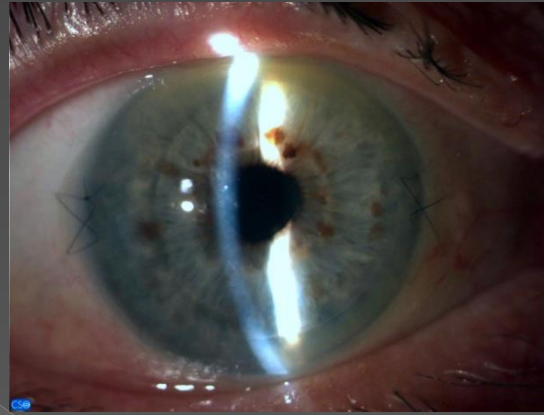
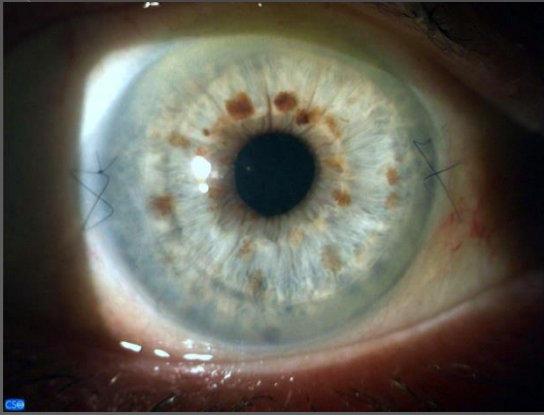


Cells = 65  
 Total area = 0,09 mm<sup>2</sup>  
 SEM = 37,53 μm<sup>2</sup>  
 Area (Avg±SD) = 1350 μm<sup>2</sup> ± 302,6 μm<sup>2</sup>  
 Density = 741 cells/mm<sup>2</sup>  
 CV = 22  
 Ex = 58%  
 Corneal thickness = 550 μm

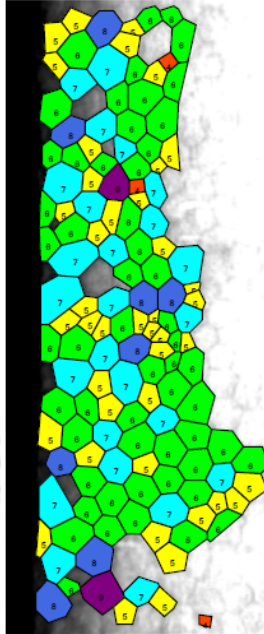


Cells = 98  
 Total area = 0,10 mm<sup>2</sup>  
 SEM = 33,52 μm<sup>2</sup>  
 Area (Avg±SD) = 987 μm<sup>2</sup> ± 331,8 μm<sup>2</sup>  
 Density = 1013 cells/mm<sup>2</sup>  
 CV = 34  
 Ex = 53%  
 Corneal thickness = 620 μm



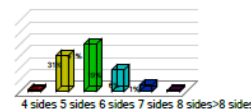
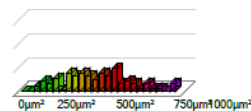


Polymegathism



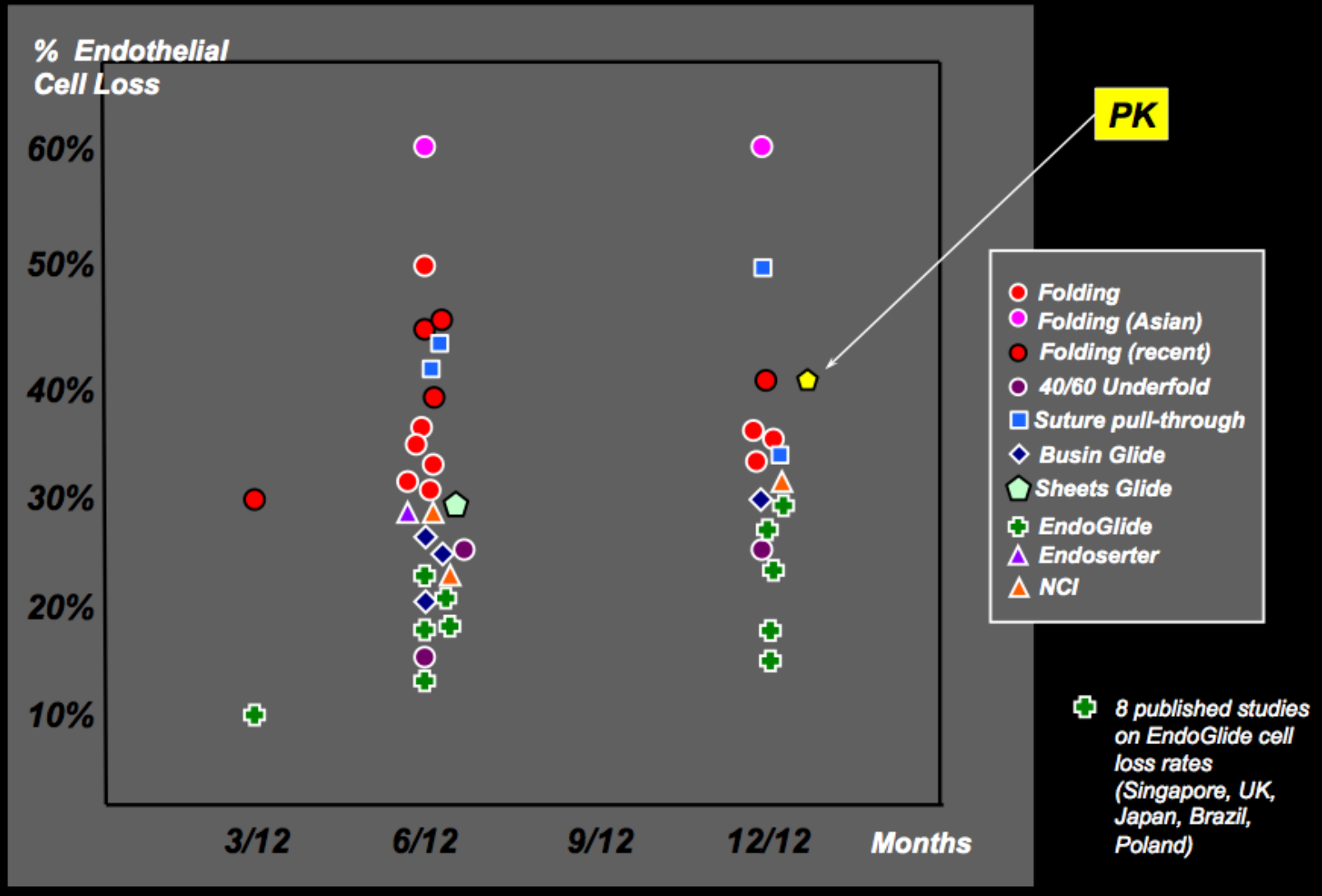
Pleomorphism

Cells = 135  
 Total area = 0.07 mm<sup>2</sup>  
 SEM = 18.88 μm<sup>2</sup>  
 Area (Avg±SD) = 491 μm<sup>2</sup> ± 219.4 μm<sup>2</sup>  
 Density = 2035 cells/mm<sup>2</sup>  
 CV = 45  
 Ex = 41%  
 Corneal thickness = 565 μm



|                      | ECL |
|----------------------|-----|
| 6 mesi (11 pazienti) | 20% |
| 12 mesi (8 pazienti) | 37% |
| 24 mesi (3 pazienti) | 51% |

## Endothelial cell loss with various insertion techniques





*GRAZIE PER  
L'ATTENZIONE*