



**Excellence Eye Research Centre**  
Certified as Member of EVICR.net  
**University "G. d'Annunzio" Chieti-Pescara**  
Head. Prof. Leonardo Mastropasqua

**CNAT**

Centro  
Nazionale  
di Alta Tecnologia  
in Oftalmologia

# Multilayer AMT for deep corneal ulcers and perforations

**Mario Nubile MD, PhD**

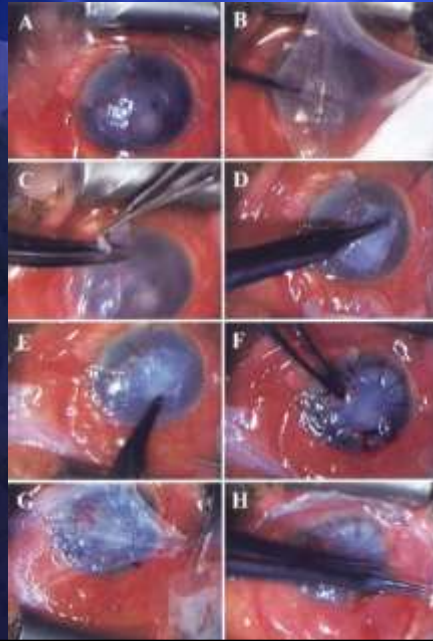
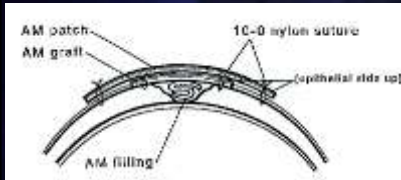
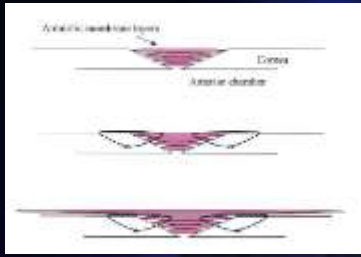


## *Histological features of transplanted AM: implication for corneal wound healing* Said DG, Nubile M, Dua HS et al. Ophthalmology 2009



The amnion stroma supports CSDC and epithelial cells. Repopulation of the amniotic stroma by CSDC migrating through breaks in Bowmans zone integrates the amnion with corneal tissue and allows for rebuilding of corneal stroma.

# Multi-layer AMT for deep corneal ulcers



**Ulcer healing – epithelial closure**  
**(Basement membrane substrate)**  
**Recovery of stromal thickness**

Solomon A Ophthalmology 2002  
 Kruse et al, Ophthalmology 1999

## Deep stromal ulcer: risk of perforation

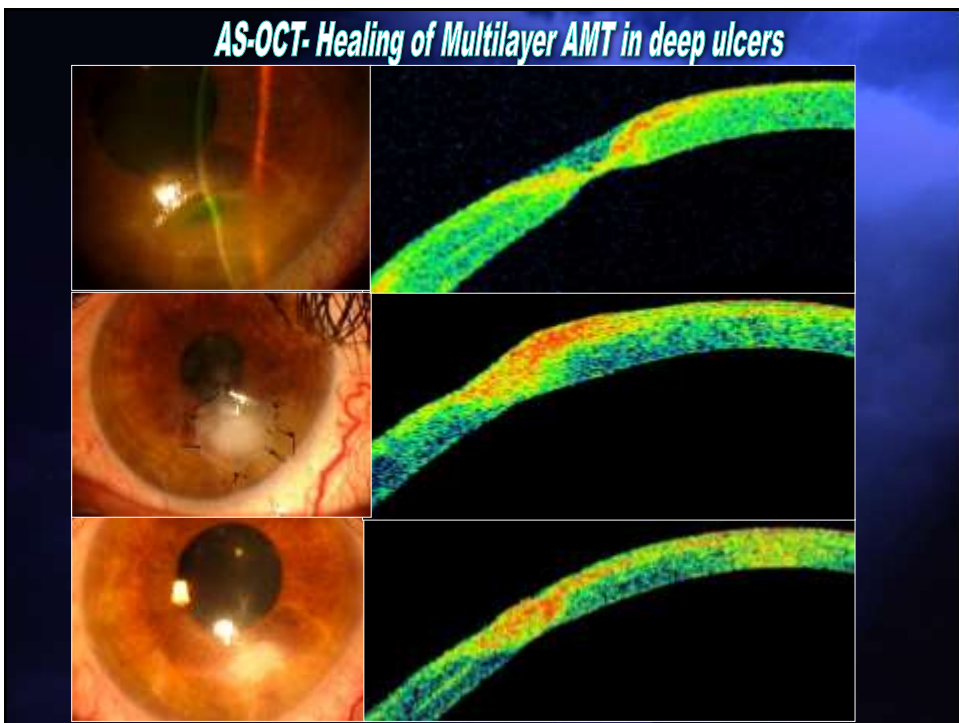
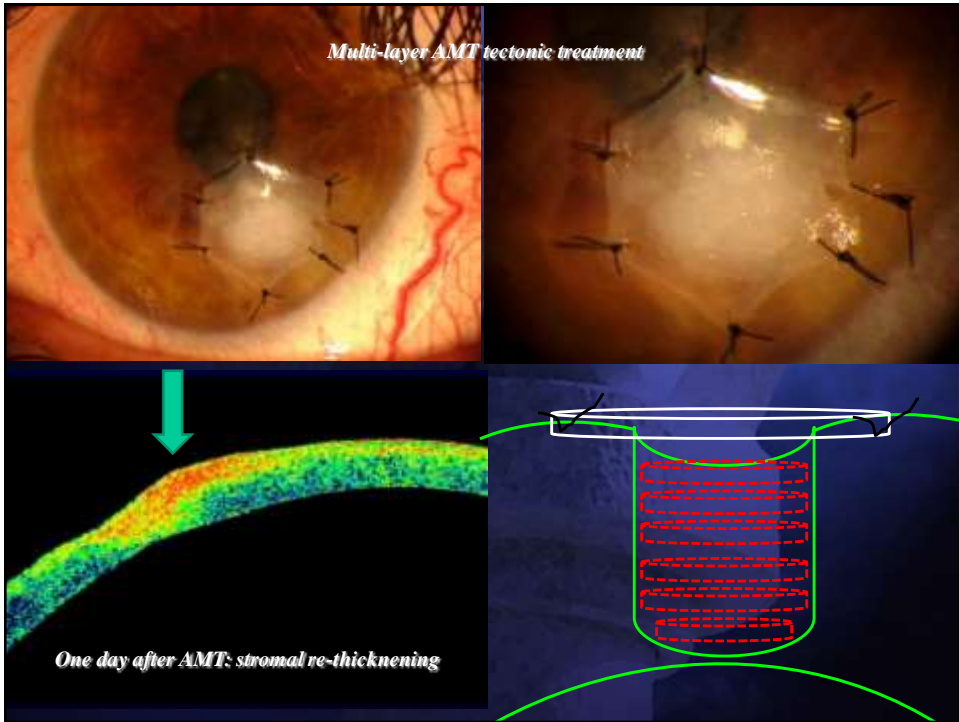


*Peripheral neurotrophic ulcer*

*4 days after: worsening*



*7 days: worsening despite conservative treatment*

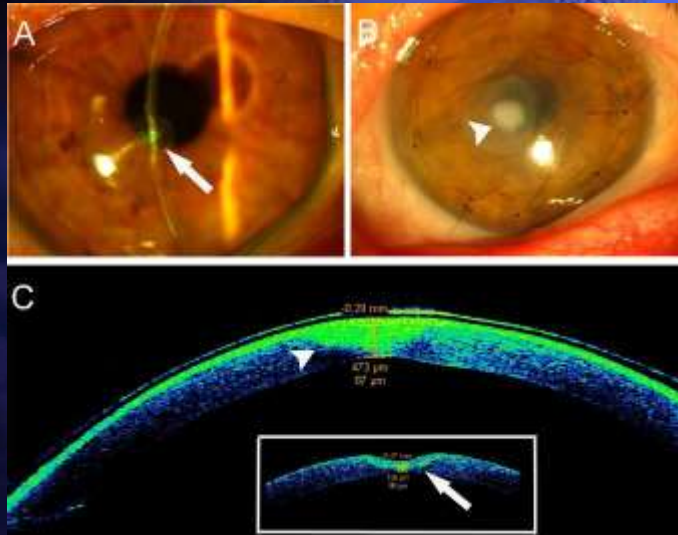




# In Vivo Analysis of Stromal Integration of Multilayer Amniotic Membrane Transplantation in Corneal Ulcers

MARCO NUBILE, HARMINDER S. DUA, MANUELA LANZINI, MARCO CIANCAGLINI, ROBERTA CALIENNO, DALIA G. SAID, AUGUSTO POCOBELLI, RODOLFO MASTROPASQUA, AND PAOLO CARPINETO

*American Journal of Ophthalmology 2012*



## AS-OCT findings and measures at the ulcer site before and after multi layer AMT

TABLE 2. Anterior Segment Optical Coherence Tomography Morphometric Parameters\* Before and After Amniotic Membrane Transplantation

Time	Preoperative		1 Day		1 Week		1 Month		3 Months		6 Months		12 Months	
	Thickness	AM Thickness	Total CT	AM Thickness	Total CT	AM Thickness	Total CT	AM Thickness	Total CT	Total CT	Total CT	Total CT	Total CT	
Mean	222.7	194.8	623.4 <sup>a</sup>	375.4	599.0 <sup>b</sup>	331.7 <sup>c</sup>	548.5 <sup>d</sup>	269.5 <sup>e</sup>	494.5 <sup>f</sup>	420.2 <sup>g</sup>	406.5	406.5	406.5	
SD	70.3	60.4	50.9	79.7	54.9	66.0	46.1	74.2	54.1	61.2	70.6	70.6		

AM = amniotic membrane; CT = corneal thickness; SD = standard deviation.  
 (Tukey post hoc - ANOVA test for repeated measures)  
 \*All thicknesses are expressed in  $\mu\text{m}$ . Total CT was calculated including the epithelium when present. The surface of the contact lens, if present, was excluded in any case. The preoperative thickness describes the minimal corneal thickness found measuring the residual stroma at the bottom of the ulcer.

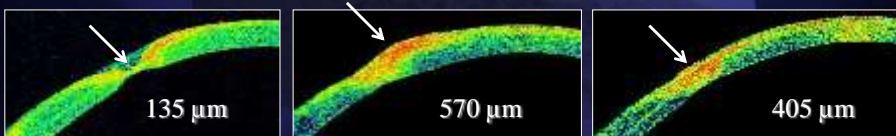
<sup>a</sup>P < .001 between preoperative thickness and 1-day-postoperative total CT and between preoperative thickness and 12 months total CT (paired Student t test).

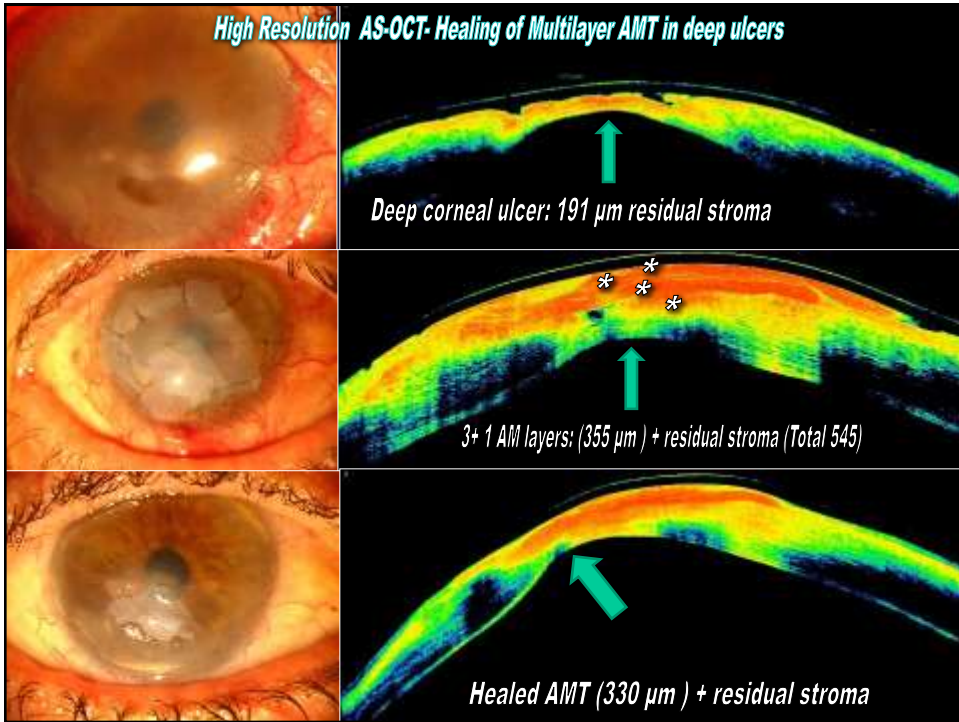
<sup>b</sup>P < .001 between 1 week and 1 and 3 months.

<sup>c</sup>P < .001 between 1 week and 1 month.

<sup>d</sup>P = .003 between 1 and 3 months.

<sup>e</sup>P = .008 between 3 and 6 months.





## Intra-stromal integration of the amniotic membrane

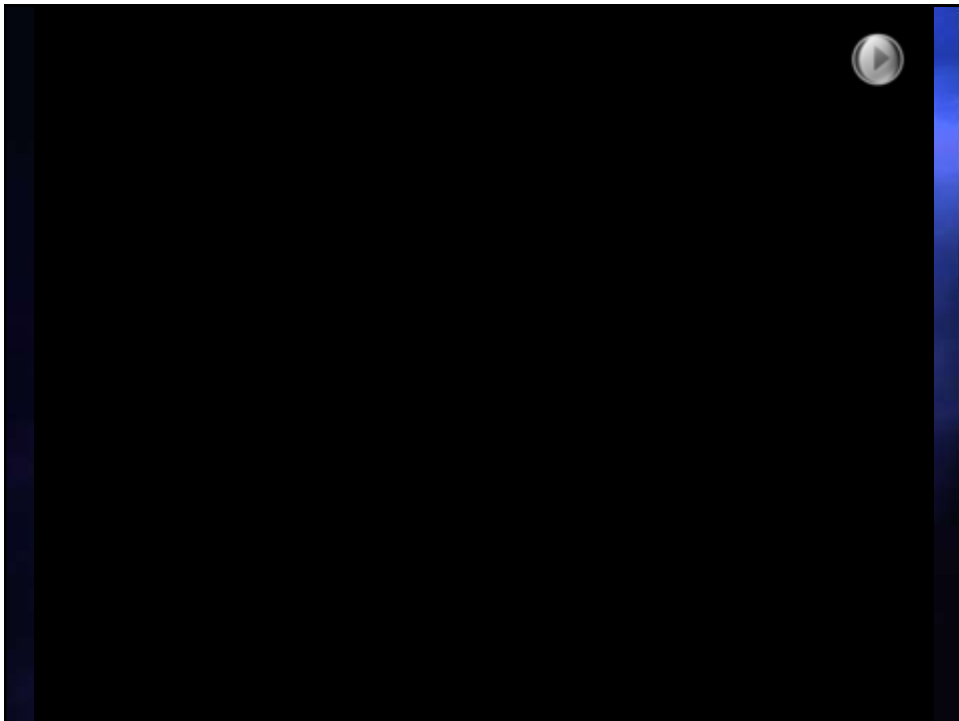
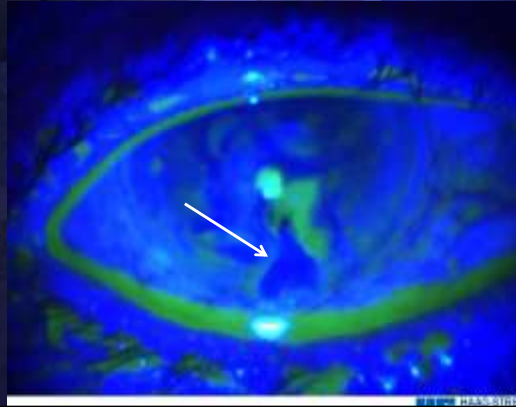
**Multi-layer AMT**

1. Multiple layers of AM can integrate into the corneal stroma with resulting increase in corneal thickness
2. This appears to be related to re-epithelization of the transplanted AM
3. Integrated amnion within the stromal defect undergoes progressive changes including contraction of tissue and repopulation by corneal-stroma-derived cells

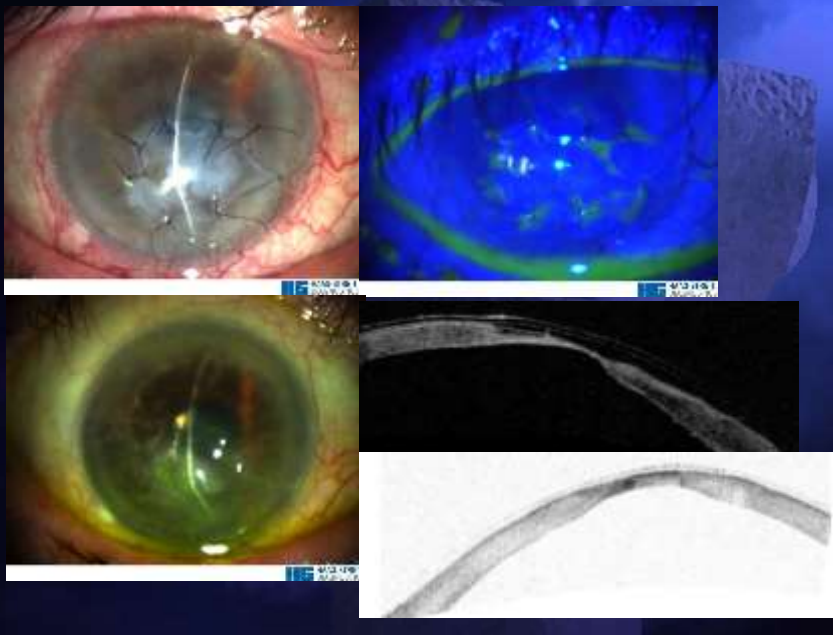
AM filling

Corneal stroma

# Post Herpetic Perforated Neurotrophic corneal Ulcer



### Multi-layer AMT for neurotrophic perforation with large melting



### Corneal peripheral perforation in Sjogren S. with chronic oedema

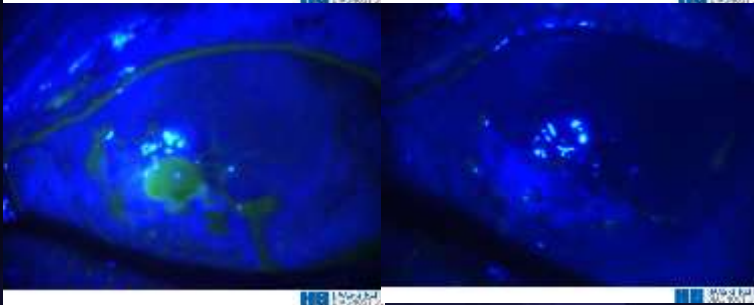




**Multi-layer AMT for perforated PUK (intraoperative OCT)**



**Multi-layer AMT for perforated PUK in Sjogren S.**







Thank you  
for your  
attention