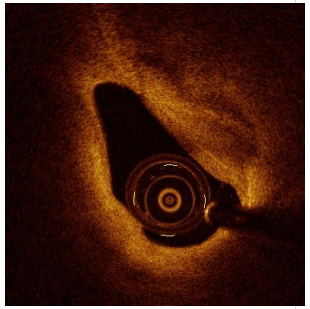
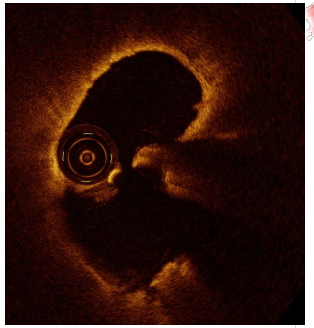
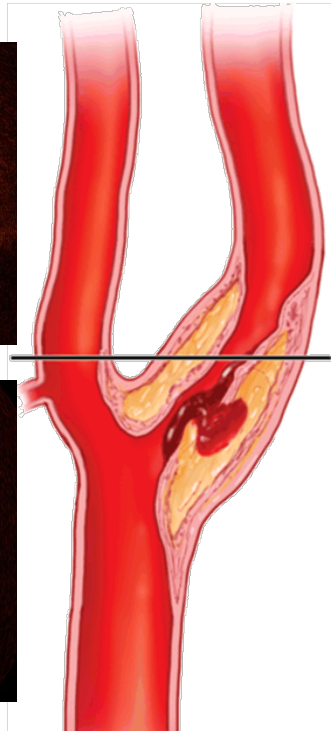
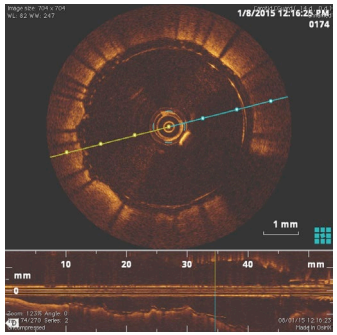
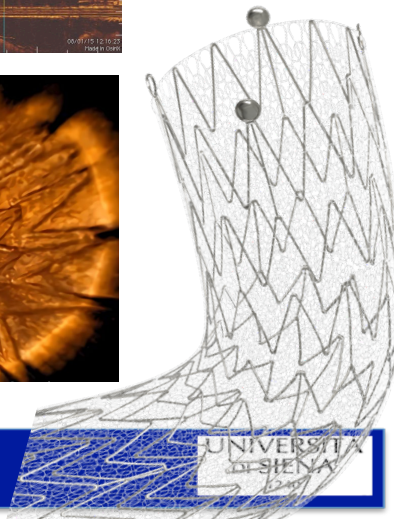
Optical Coherence Tomography analysis of CAS and the benefits of micromesh stent design











Gianmarco de Donato

Full Professor of Vascular Surgery
Chief, Vascular Surgery Unit &
Vascular Surgery Residency Program
University of Siena
Italy

Disclosure

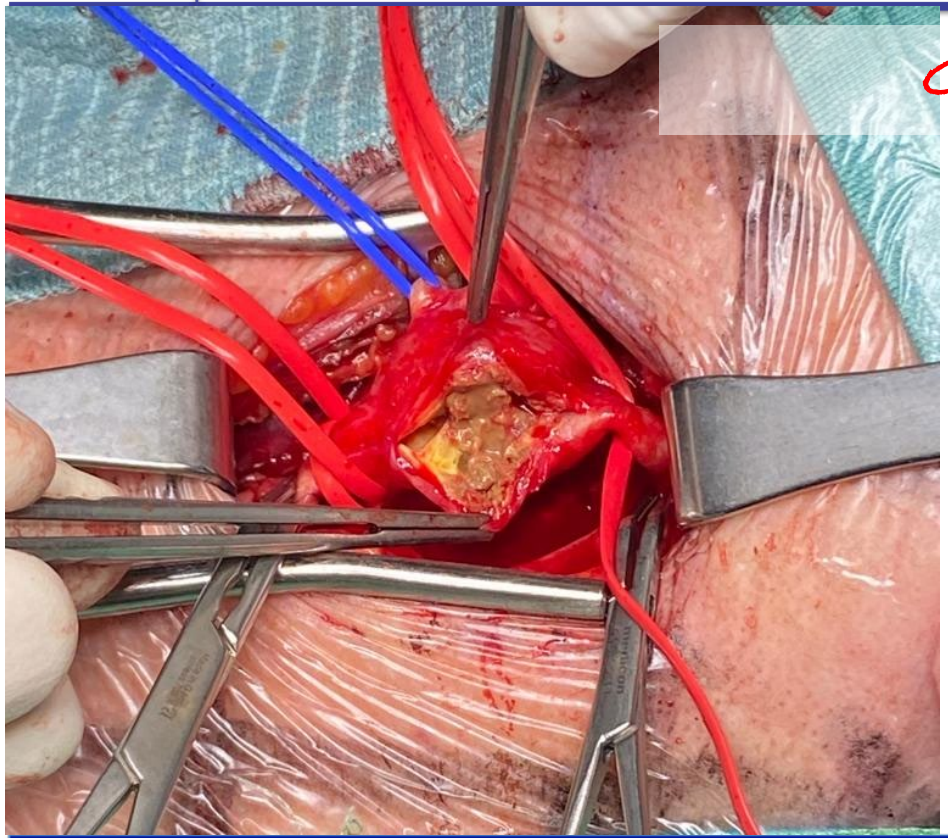
Speaker's name: Gianmarco de Donato

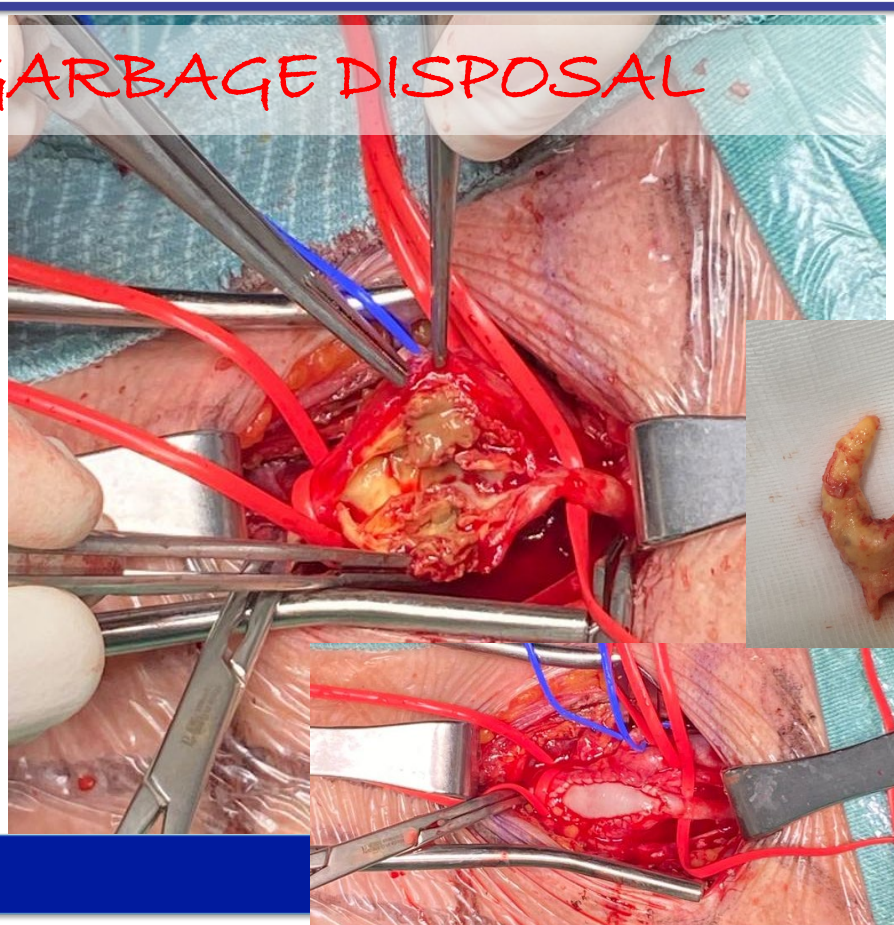
x **I have the following** potential conflicts of interest to report:

- ☐ Research contracts
- x Travel & educational grants (Boston Scientific, Terumo, Inspire, Endologix, Gore, Penumbra)
- ☐ Employment in industry
- ☐ Stockholder of a healthcare company
- ☐ Owner of a healthcare company
- ☐ Other(s)

☐ **I do not have any potential conflict of interest**

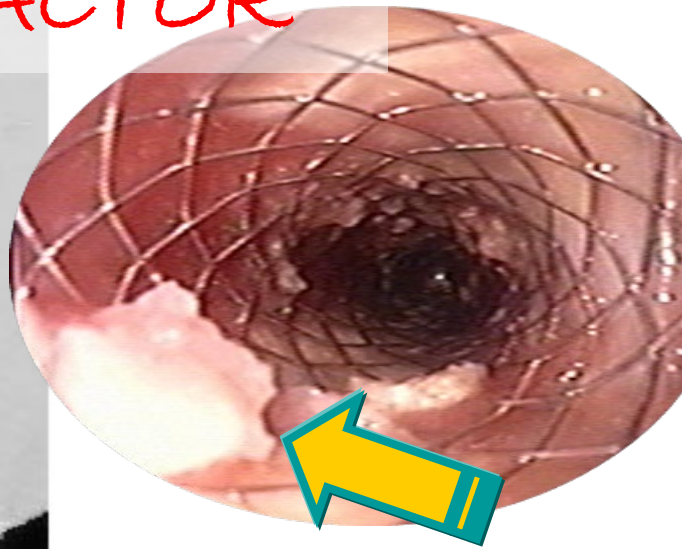
Treatment options





Treatment options

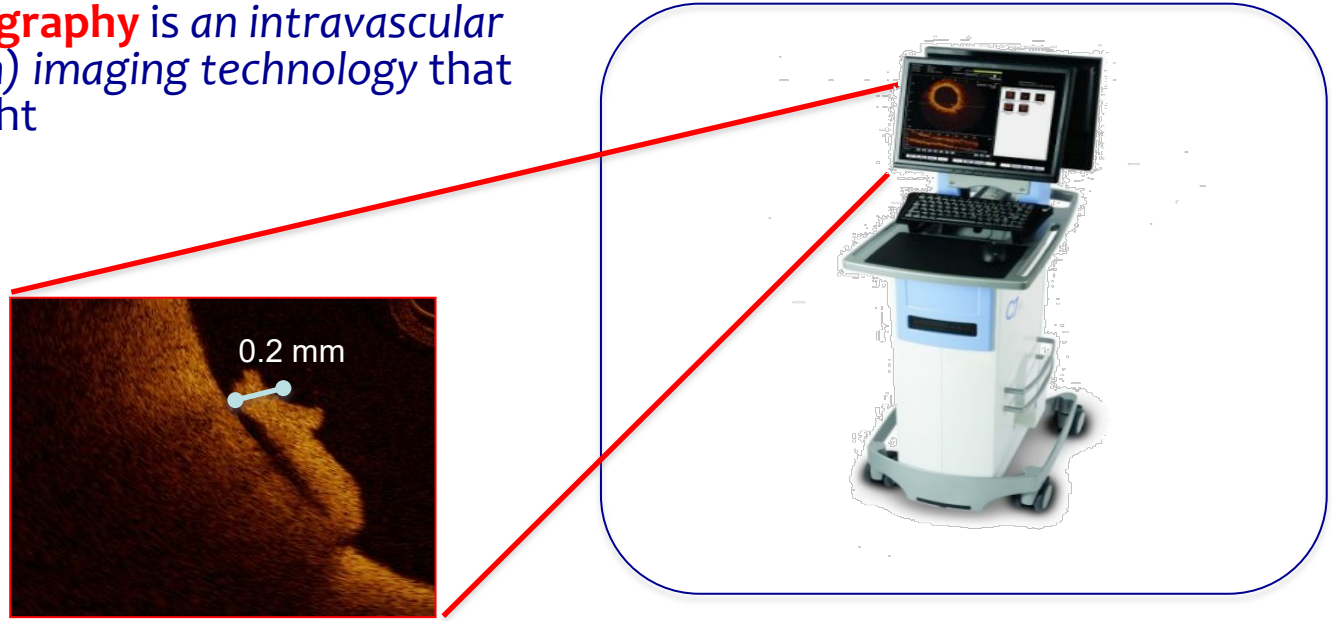
- **ENDOVASCULAR** → Plaque containment!



Courtesy of M. Makaroun, University of Pittsburg
Courtesy of K. Balzer, Mulheim

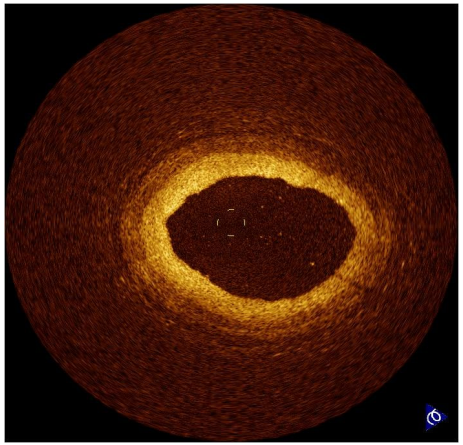
OCT for Stent Selection

Optical Coherence Tomography is *an intravascular high-resolution (10 micron) imaging technology* that employs near-infrared light

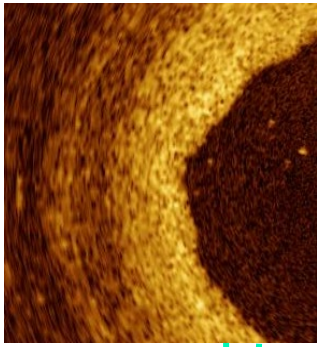


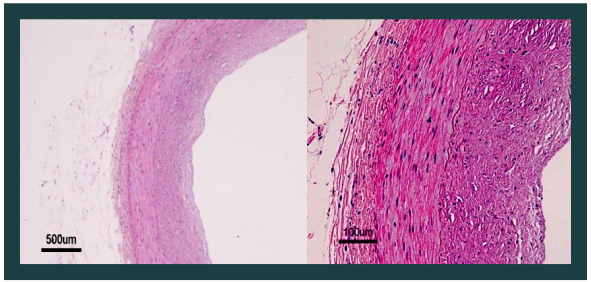
What is OCT?

OCT is a high-resolution imaging technology



OCT





Histology

J ENDOVASC THER
2012;19:303–311

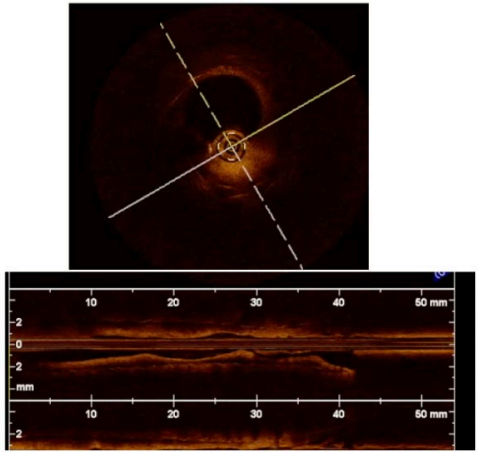
◆ CLINICAL INVESTIGATION ◆

Safety and Feasibility of Intravascular Optical Coherence Tomography Using a Nonocclusive Technique to Evaluate Carotid Plaques Before and After Stent Deployment

Carlo Setacci, MD; Gianmarco de Donato, MD; Francesco Setacci, MD; Giuseppe Galzerano, MD; Pasqualino Sirignano, MD; Alessandro Cappelli, MD; and Giancarlo Palasciano, MD

Department of Surgery, Vascular and Endovascular Surgery Unit, University of Siena, Italy.

Conclusions: Intravascular OCT during a nonocclusive flush appears to be feasible and safe in carotid arteries.

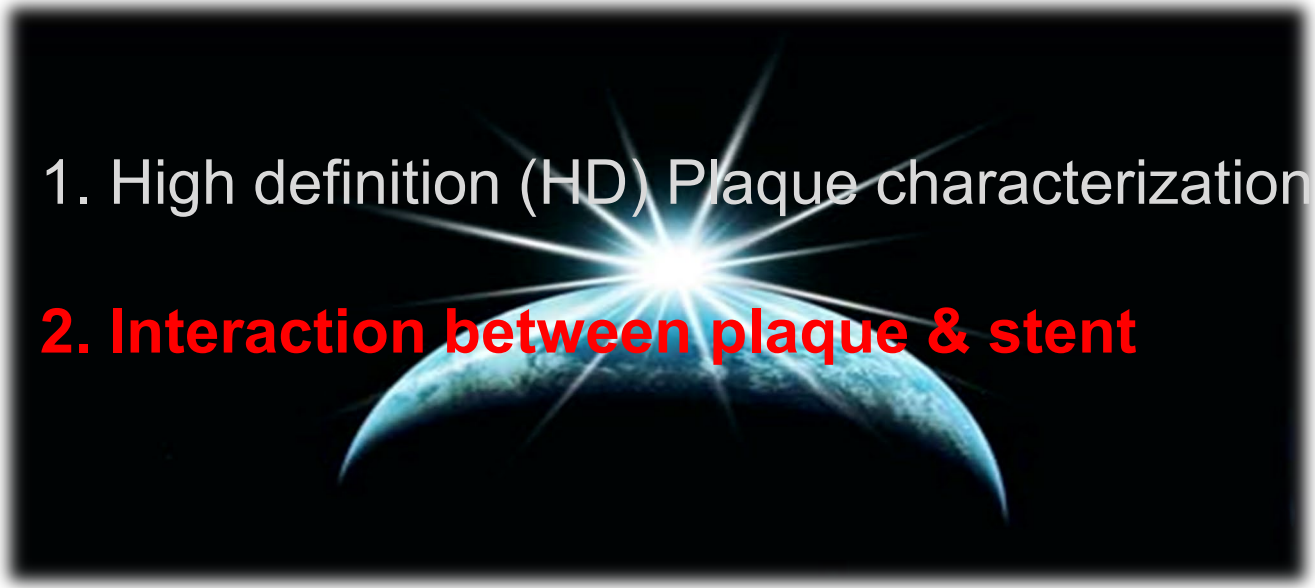


Mechanical injection of 20 ml 50% diluited contrast at 6ml/sec (to replace blood from the artery)

J Endovasc Ther 2012 Jun;19(3):303-11

Why do I use OCT in carotids?

UTILITY - results



OCT in carotids – new frontiers

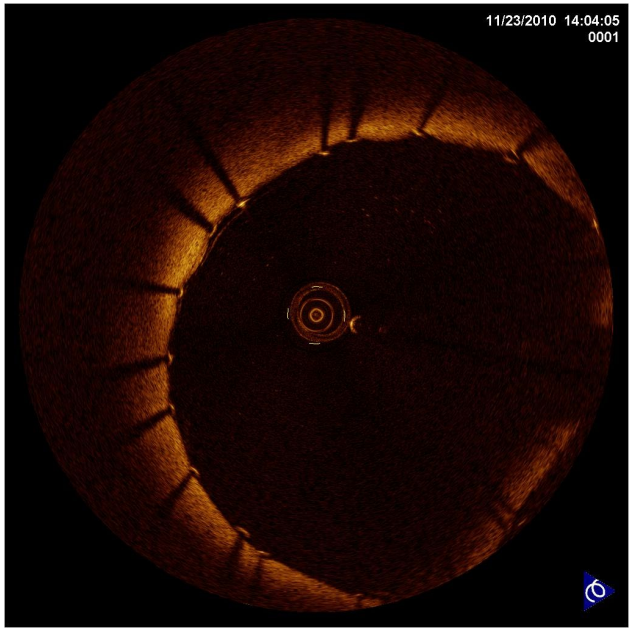
2. Interaction between plaque & stent

Intraop control:

- Residual stenosis
- **Stent apposition**
- Stent malapposition
- Cell area modification
- Fibrous cap rupture
- Plaque micro-prolaps
- Branch side coverage

Follow-up control:

- neointimal thickness
- complete/incomplete stent struts coverage



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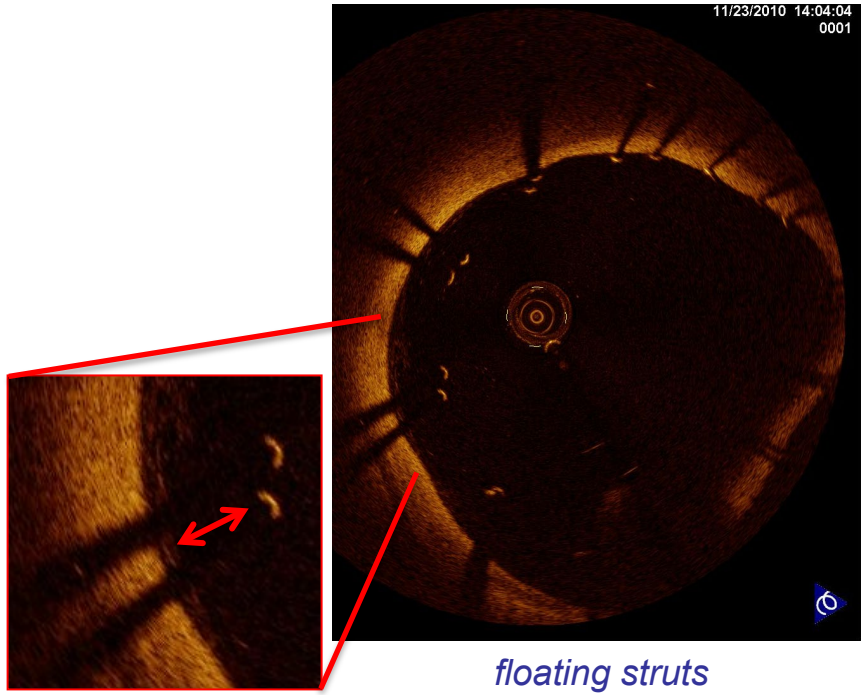

floating struts

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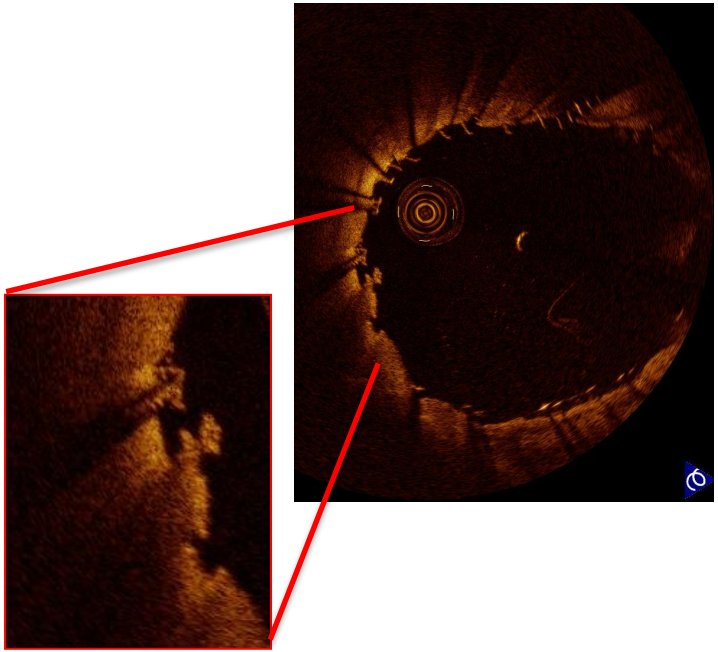

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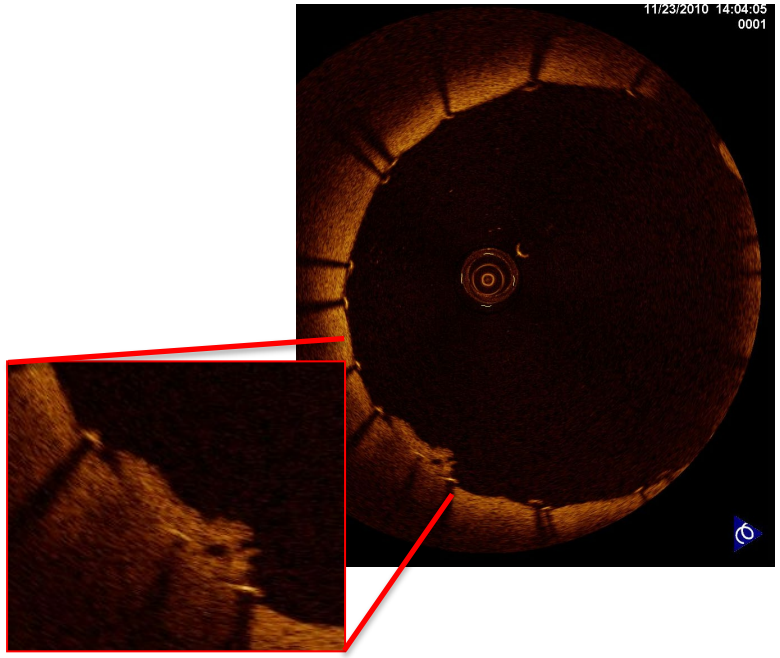

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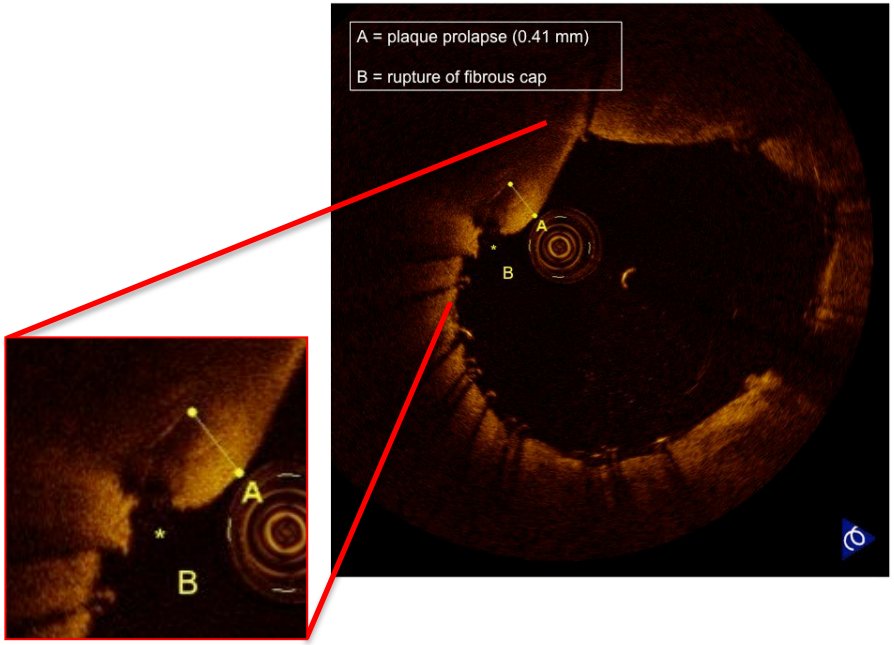


High-resolution makes the difference

Low-resolution image

High-resolution image

OCT & Carotid stent design

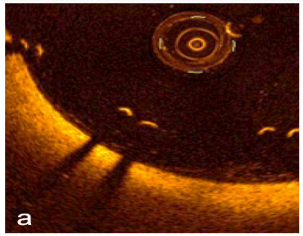
Design

Prospective single center study

Objectives

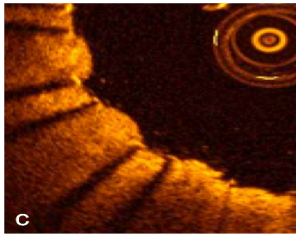
To evaluate the rate of:

- **stent malapposition**
- plaque prolapse
- fibrous cap rupture



"Malapposed"

"Well apposed"



"Embedded"

G. de Donato, F. Setacci, P. Sirignano, G. Galzerano, A.Cappelli, C. Setacci. OPTICAL COHERENCE TOMOGRAPHY AFTER CAROTID STENTING: RATE OF STENT MALAPPOSITION, PLAQUE PROLAPSE AND FIBROUS CAP RUPTURE ACCORDING TO STENT DESIGN. ***Eur J Vasc Endovasc Surg 2013;45:579-87***

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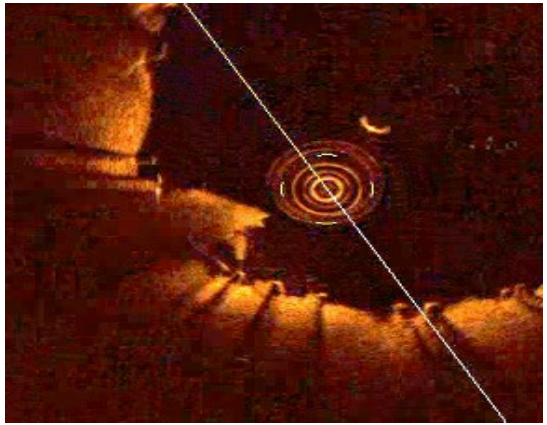

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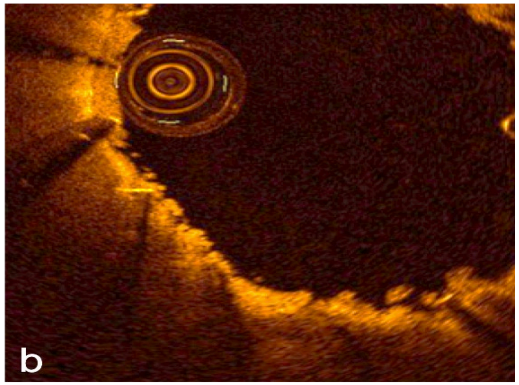

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OCT & Carotid stent design

Design

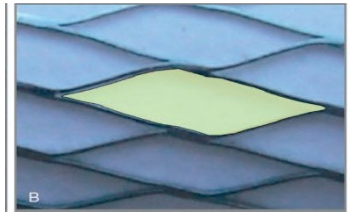
Prospective single center study

Objectives

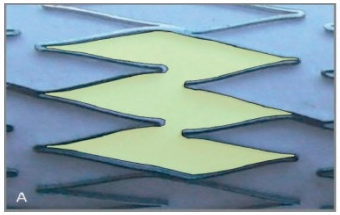
To evaluate the rate of:

- stent malapposition
- plaque prolapse
- fibrous cap rupture

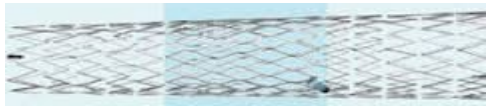
according to carotid stent design



Closed cell (CC)



Open cell (OC)



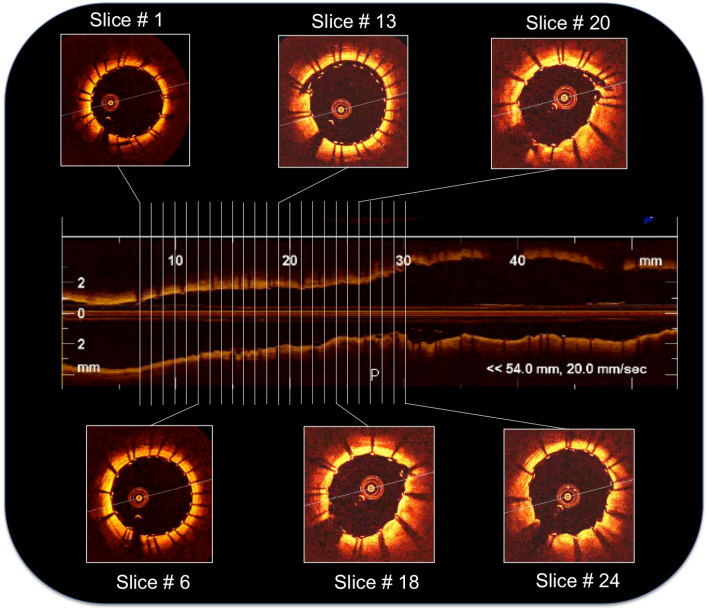
Hyb

open closed open

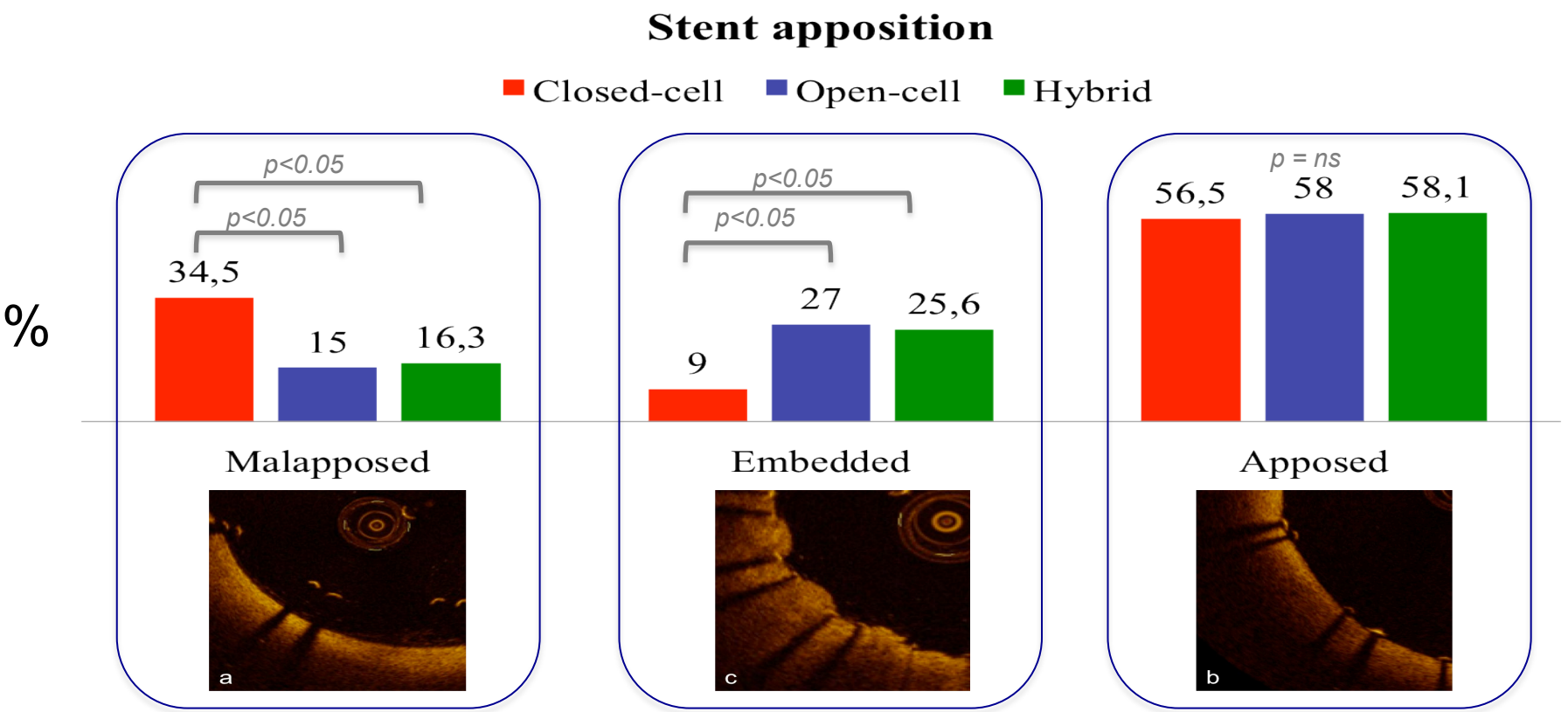
Eur J Vasc Endovasc Surg 2013;45:579-87

Materials and Methods

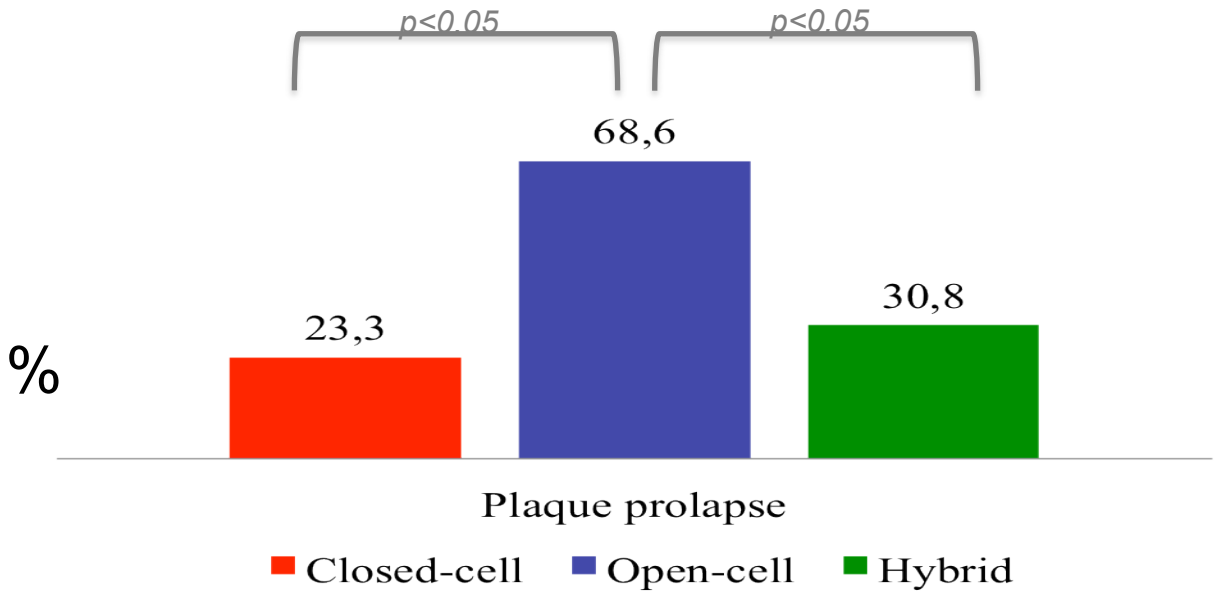
- 40 consecutive patients undergoing protected CAS + OCT
- Off-line analysis of OCT frames (dedicated core laboratory)
- Cross-sectional OCT images within the ICA were evaluated at 1 mm intervals.

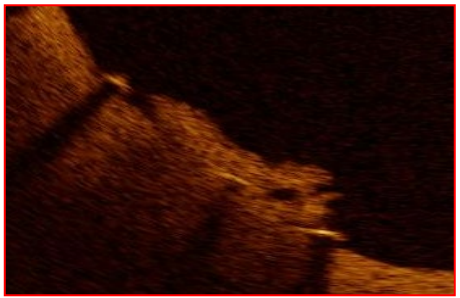


Results:
Stent apposition



Results:
Plaque prolapse





Slice-based analysis (1 mm interval)

Meta-analysis Second- vs. First- generation carotid stents

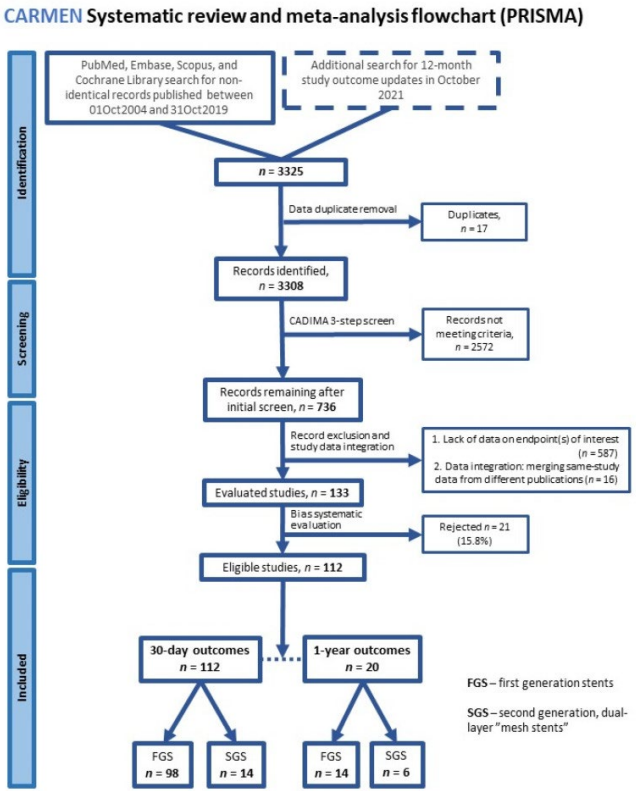
Review > J Clin Med. 2022 Aug 17;11(16):4819. doi: 10.3390/jcm11164819.

Clinical Outcomes of Second- versus First-Generation Carotid Stents: A Systematic Review and Meta-Analysis

Adam Mazurek [1], Krzysztof Malinowski [2], Kenneth Rosenfield [3], Laura Capoccia [4], Francesco Speziale [4], Gianmarco de Donato [5], Carlo Setacci [5], Christian Wissgott [6], Pasqualino Sirignano [4], Lukasz Tekieli [7], Andrey Karpenko [8], Waclaw Kuczmik [9], Eugenio Stabile [10], David Christopher Metzger [11], Max Amor [12], Adnan H Siddiqui [13], Antonio Micari [14], Piotr Pieniążek [1 7], Alberto Cremonesi [15], Joachim Schofer [16], Andrej Schmidt [17], Piotr Musialek [1],
CARMEN (CArotid Revascularization Systematic Reviews and MEta-aNalyses) Investigators

Affiliations + expand

PMID: 36013058 PMCID: PMC9409706 DOI: 10.3390/jcm11164819
Free PMC article



Data of 68,422 patients from 112 eligible studies were meta-analyzed

Meta-analysis Second- vs. First- generation carotid stents

30-day death, stroke, myocardial infarction

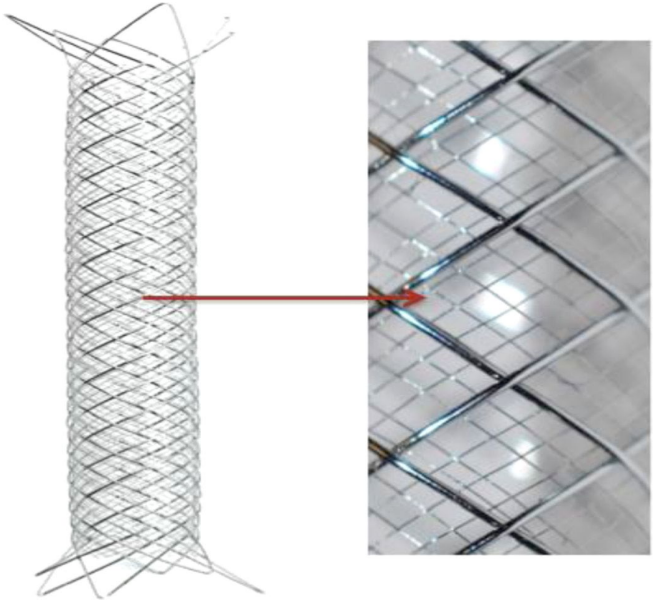
First generation	Second generation	
4.1%	1.3%	p<.05

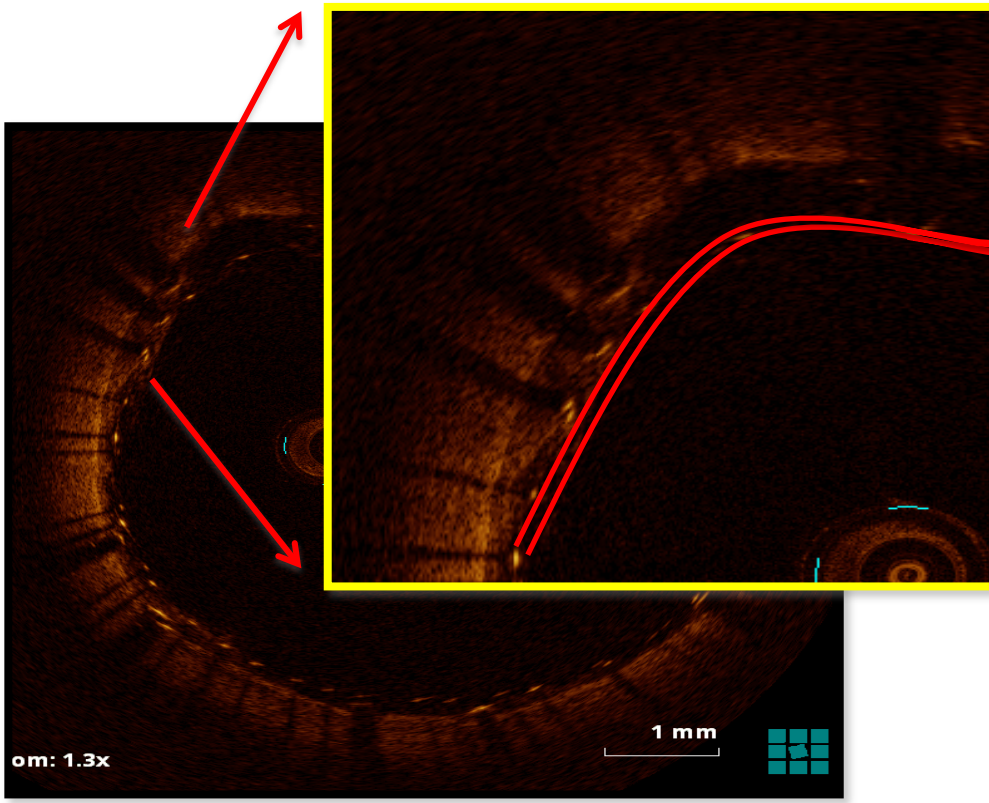
30-day stroke

First generation (closed cell)	Second generation	
2.3%	0.6%	p<.05

Review > J Clin Med. 2022 Aug 17;11(16):4819. doi: 10.3390/jcm11164819.

New carotid stent design

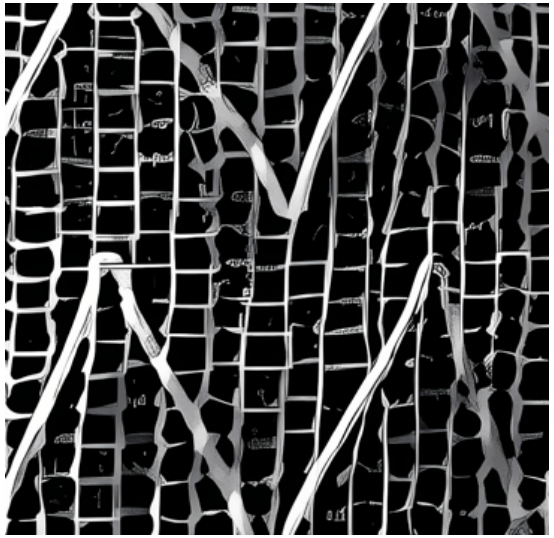




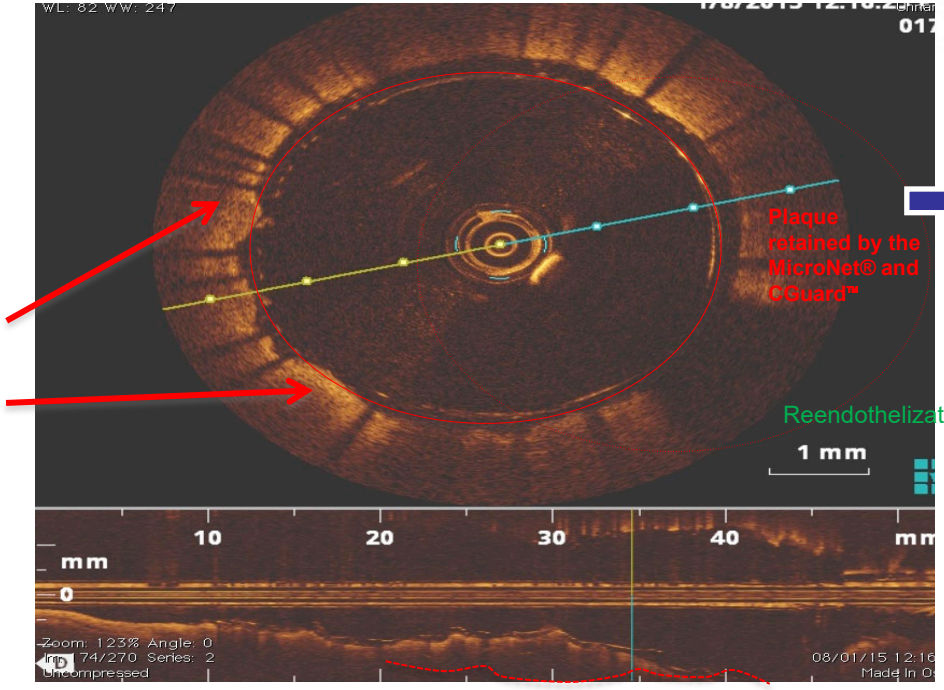
Terumo Road saver:
Double layer nitinol design

The mesh stent

Inspire C-Guard



Open-cell nitinol frame
+
Outside PET micronet
Cell size : 150-180 μm



New Generation, Mesh-Covered Stents

EuroIntervention
Official Journal of EuroPCR and the European Association of Percutaneous Cardiovascular Interventions (EAPCI)

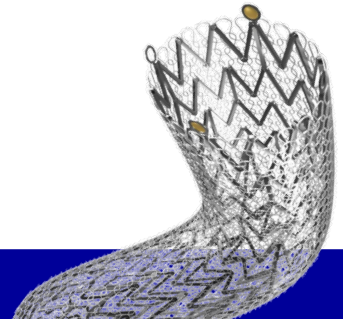
IMPACT FACTOR 5.165
2016 Journal Citation Reports ® Science Edition (Clarivate Analytics, 2017)

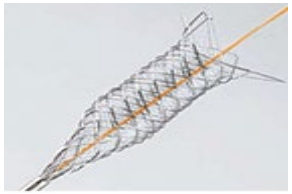
JUST ACCEPTED ARTICLE

EuroIntervention. 2017 Aug 1. pii: EIJ-D-16-00866. doi: 10.4244/EIJ-D-16-00866. [Epub ahead of print]

Optical Coherence Tomography Assessment of New Generation Mesh- Covered Stents after Carotid Stenting.

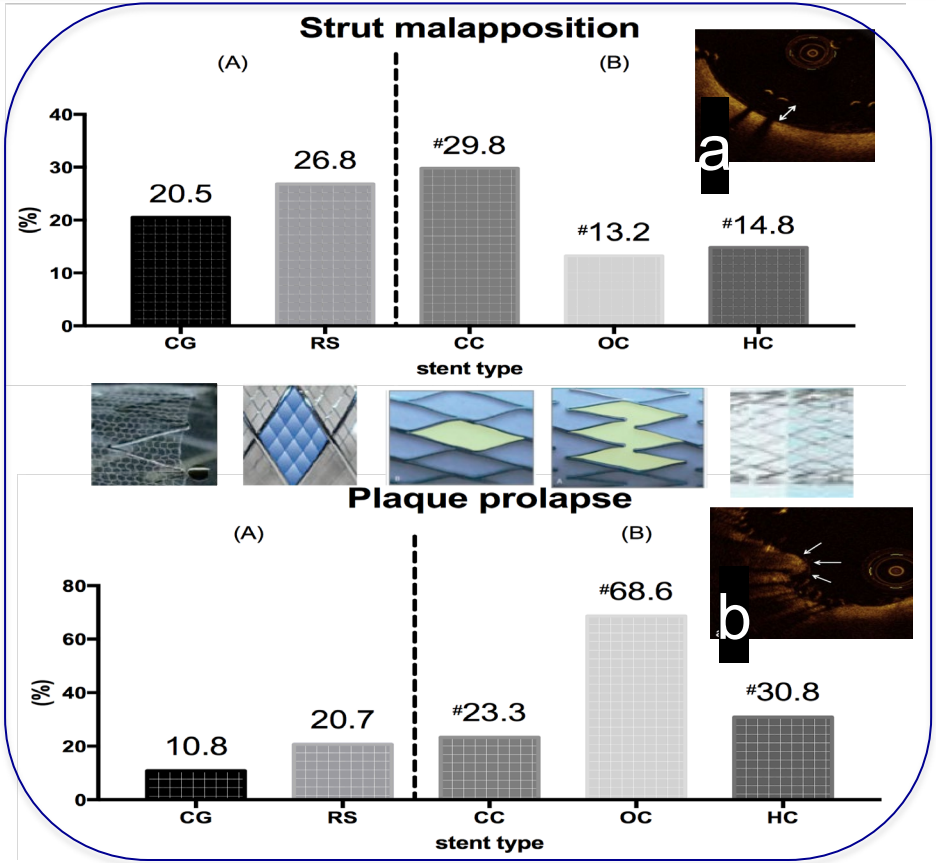
Umemoto T[1], de Donato G, Pacchioni A, Reimers B, Ferrante G, Isobe M, Setacci C.





EuroIntervention. 2017 Aug

Outcomes



- No procedural neurological complications occurred (TIA/stroke/death 0% at 30 days).

Slice-based analysis

- Compared with conventional stents, the incidence of plaque prolapse was lower

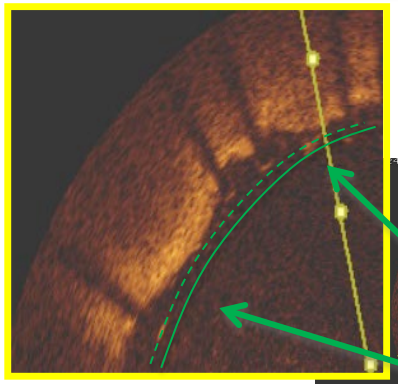
EuroIntervention. 2017 Aug

Micromesh vs. Dual layer – OCT analysis

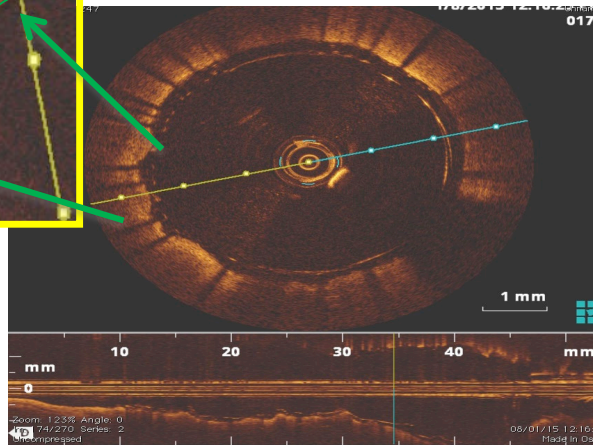
EuroIntervention. 2017 Aug

Stent	CGUARD			ROADSAVER		
Plaque type*	All type	Type 1-3	Type 4	All type	Type 1-3	Type 4
Patient n.	11	6	5	5	5	0
Slice n.	166	96	70	82	82	0
Prolapse ,n	18	9	9	17	17	0
Prolapse, %	10.8	9.3	12.8	20.7	20.7	0

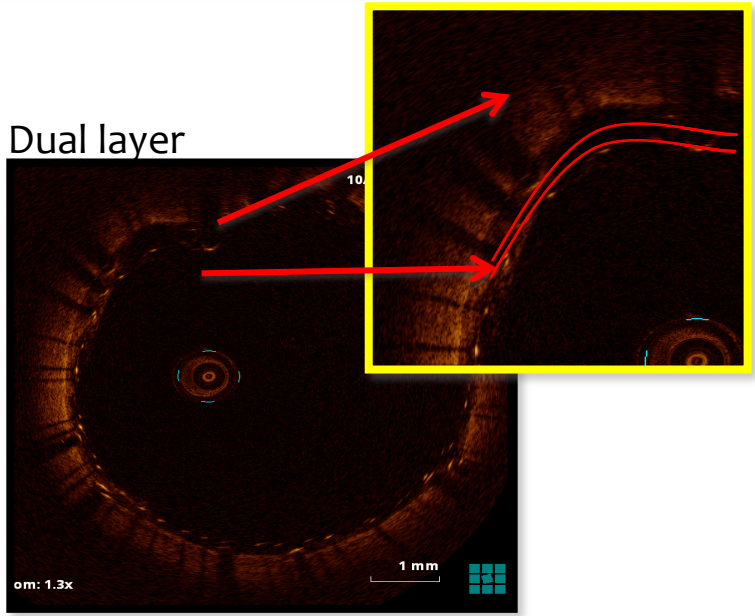
*According to the Gray-Weale classification[2]



Micromesh



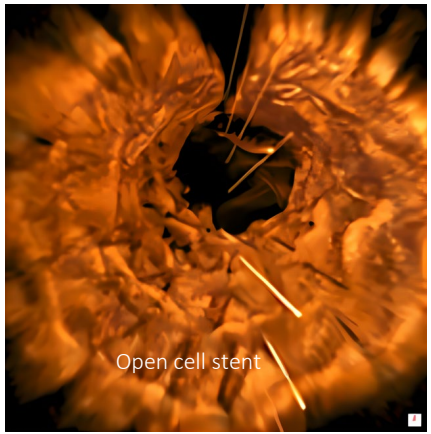
Dual layer



First vs. second generation carotid stents – OCT comparison

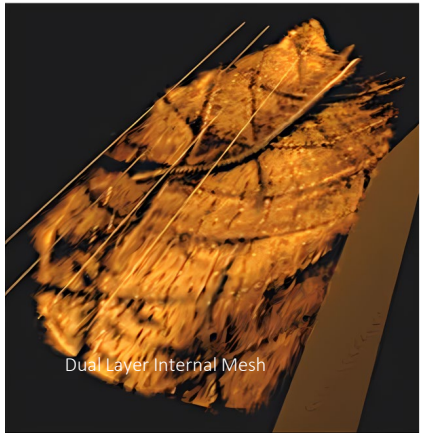
Conventional Carotid Stents

Partial and not uniform plaque coverage, leading to plaque protrusions or prolapse into the vessel lumen



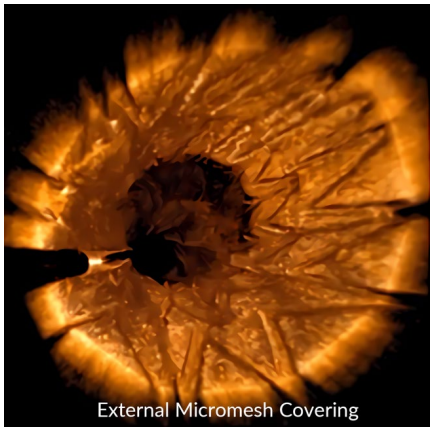
Roadsaver / Casper

Uniform plaque coverage; no plaque protrusions; big support structures are dimed by the big metal amount in the lumen



CGuard™ EPS

The MicroNet™ **permanently covers** the plaque preventing “debris” passage through the mesh



CONCLUSION

From EBM to tailored surgery & precision medicine

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