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ICCA
STROKE

types of stents
closed cell vs. open cell,
tapered vs. non tapered,
mesh stents

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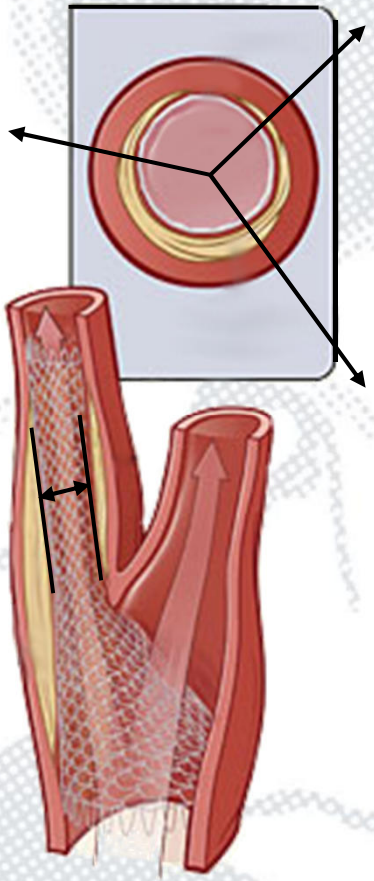
Disclosure

- I have no actual or potential conflict of interest in relation to this presentation.

Stent selection

material, construction and design

- radial force/recoil
- scaffolding
- lesion coverage
- flexibility
- conformability/bending stiffness
- side-branch preservation
- foreshortening
- radiopacity
- biocompatibility



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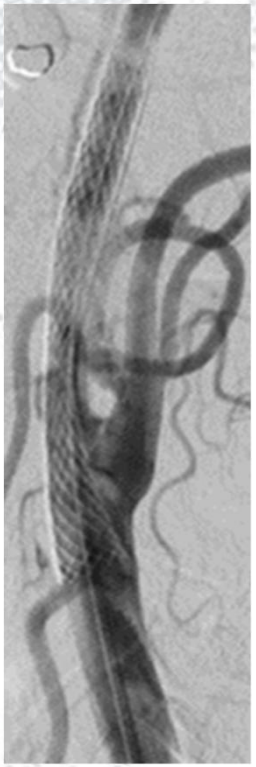

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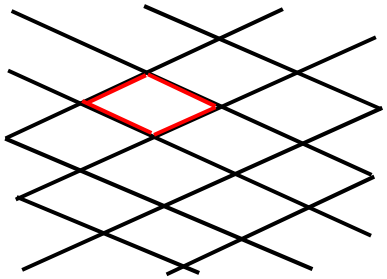
Stent geometry

closed-cell



small surface area

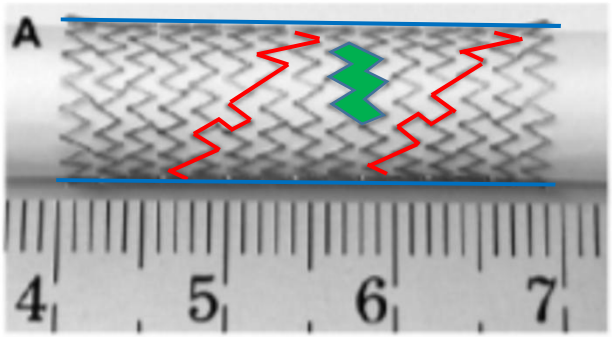
- lower flexibility
- better scaffolding
- better lesion coverage

open-cell

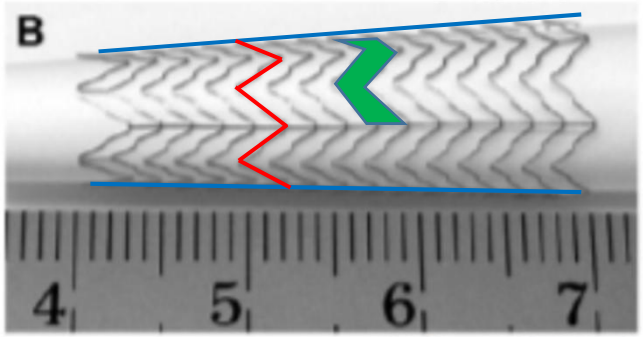
less junction points

- higher flexibility
- increased conformability
- lower longitudinal strength

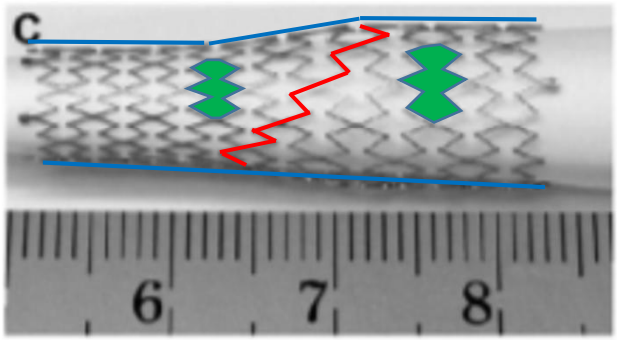
Examples of Stents



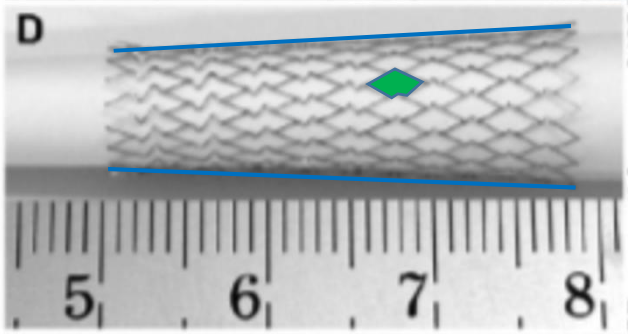
Precise



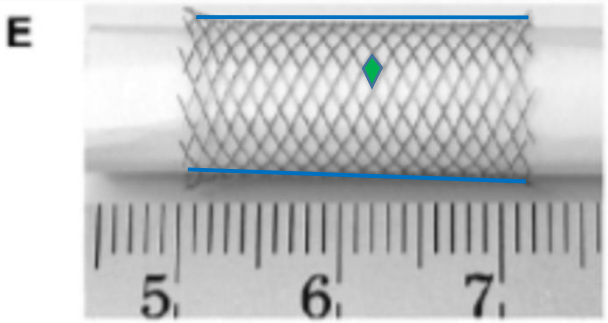
Acculink



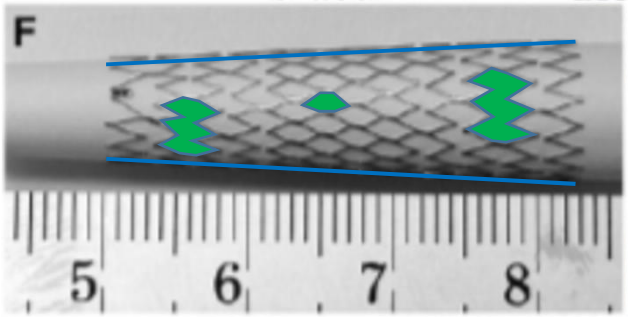
Protégé



Xact



Wallstent

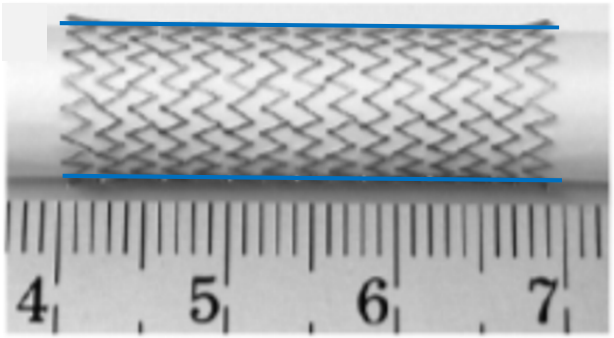


Cristallo Ideale

Gail M Siewiorek et al. J ENDOVASC THER 2009

Müller-Hülsbeck et al. JEVT 2009;16:168-177

Long-term Results of Tapered Stents in Endovascular Treatment of Carotid Stenosis



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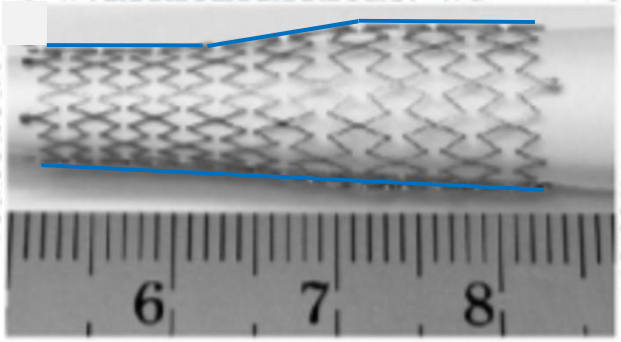


Protégé

- 1,368 procedures 2005 - 2012
- primary end points: 30-day mortality and any ipsilateral neurological event
- secondary endpoints: any late neurological event and restenosis >50%.
- cylindrical stent: 883 patients; tapered stent: 485 patients
- no significant difference in peri-procedural stroke (1.2% vs. 1.6%)
- lower risk of restenosis and neurological events for tapered stents at late outcomes

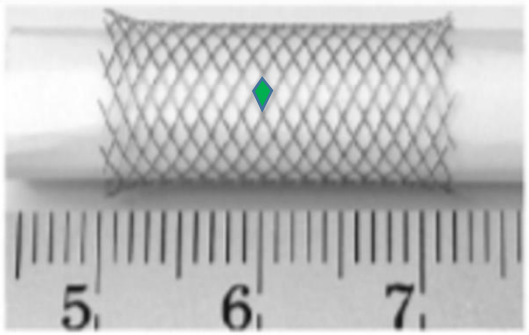
Impact of different stent types on outcome event rate (secondary analysis of SPACE Trial)

Jansen et al. Stroke. 2009.

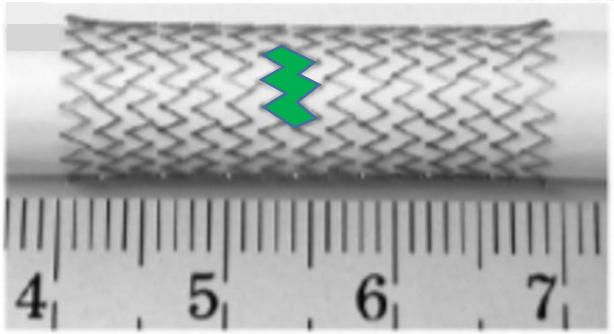
Stent	Wallstent	Acculink	Precise
No. of patients	436	92	35
Pat. with OE(Outcome Events)	24	9	5
OE rate (95% CI)	5.5% (3.6–8.1%)	9.8% (4.6–17.8%)	14.3% (4.8–30.3%)

Fig. 6

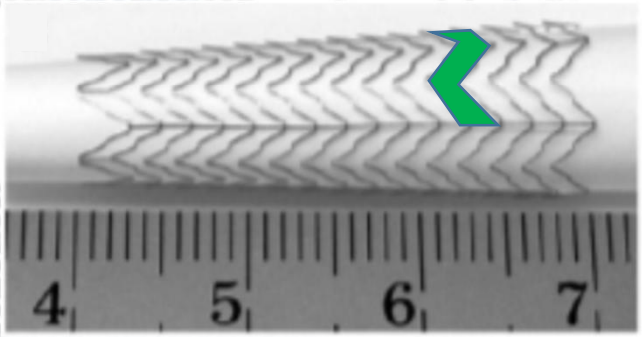
Combined OE rate: 11.0% (6.2–17.8%)



Wallstent



Acculink



Precise

Dual-layer Stents

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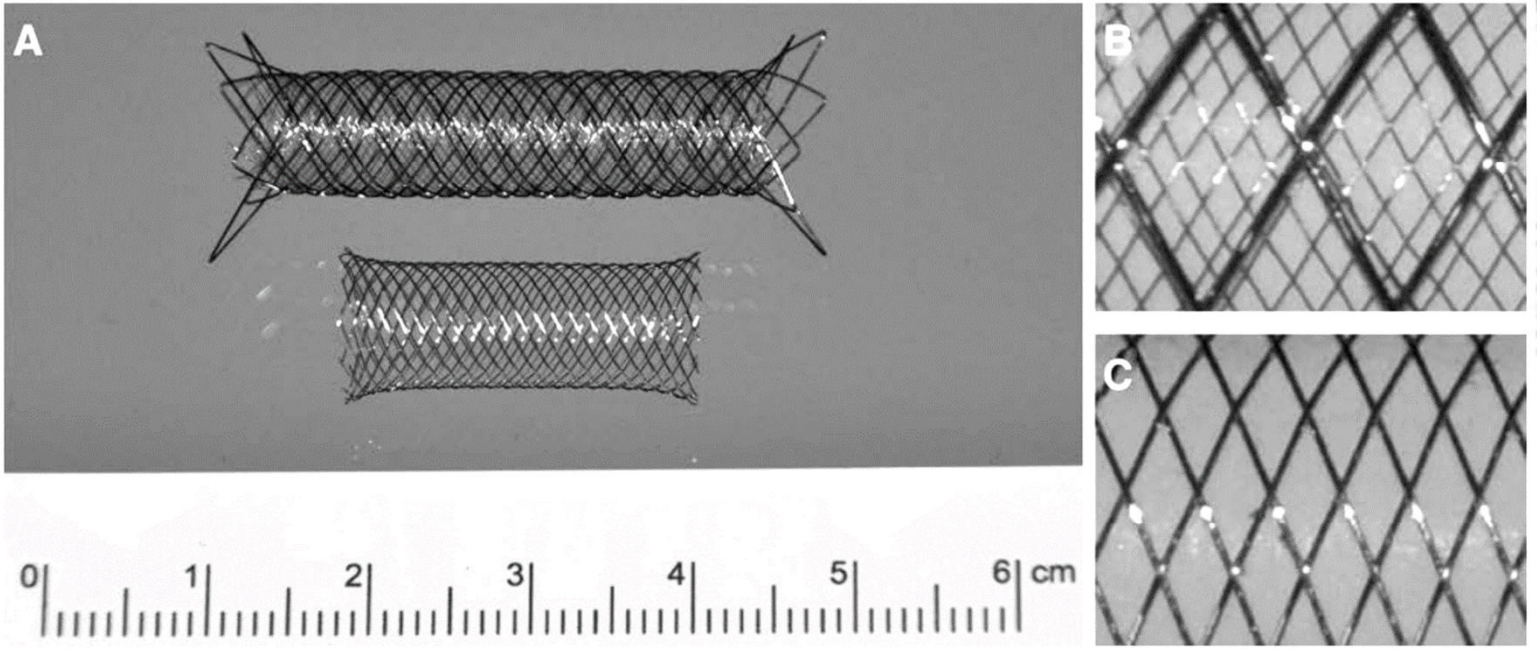
Yilmaz et al. Stroke 2017

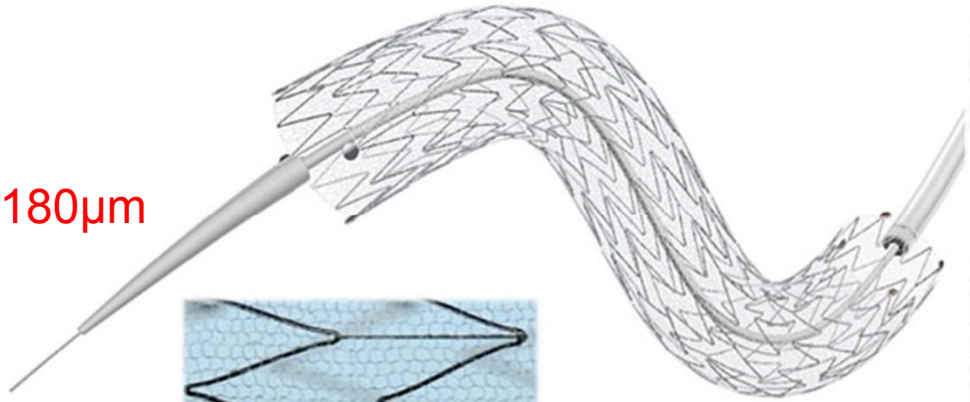
Roadsaver (Casper RX)



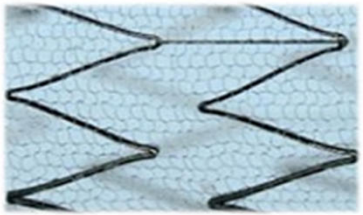
Wallstent

<500µm

Fig. 7



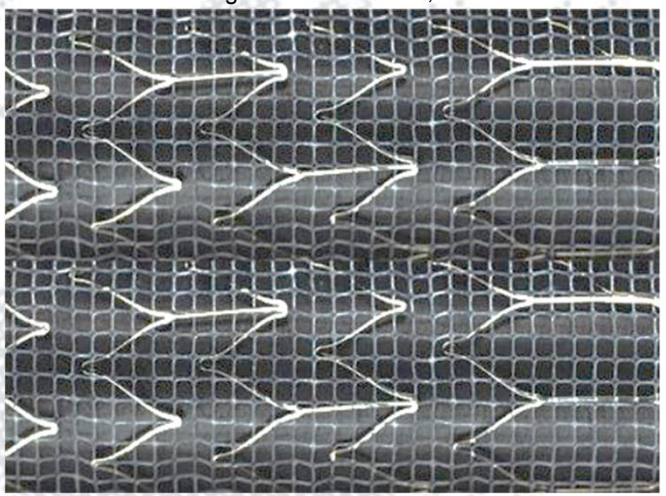
<180µm



CGuard

Schofer et al. JACC 2015

Vascular Disease Management Volume 14, No. 10 October 2017



Gore Carotid

Fig. 9

500µm

Dual-layer Stents

CGuard Roadsaver

Trials with symptomatic and asymtomatic patients

TRIAL	n	technical success	peri-procedural events	MACE 30 days
PARADIGM	101	100%	0,9% minor stroke	0%
IRON-GUARD	200	100%	2,5% minor stroke, 1% TIA	0%
CASANA	82	98,5-100%	24% DWI lesions	0%
WISSGOTT	30	100	0%	0%
CARENET	30	100	37% DWI lesions	0%
CLEAR-ROAD	100	100%	no data	2,1%
CONFIDENCE	295	-	-	-

Acute Occlusions of Dual-Layer Carotid Stents After Endovascular Emergency Treatment of Tandem Lesions

- retrospective analysis 2011-2017
- 47 patients with occlusions of the MCA or intracranial ICA:
  - 20 patients: dual-layer Casper-RX
  - 27 patients: single-layer Wallstent (closed cell, n=25) and Vivexx (open cell, n=2)
- significantly higher rate of acute stent occlusion in dual layer stent (45% versus 3.7%)
- we recommend using single-layer stents in the emergency setting

Optical Coherence Tomography after Carotid Stenting

Fig. 14 (a-d)

G. de Donato et al., Eur J Vasc Endovasc Surg 2013.

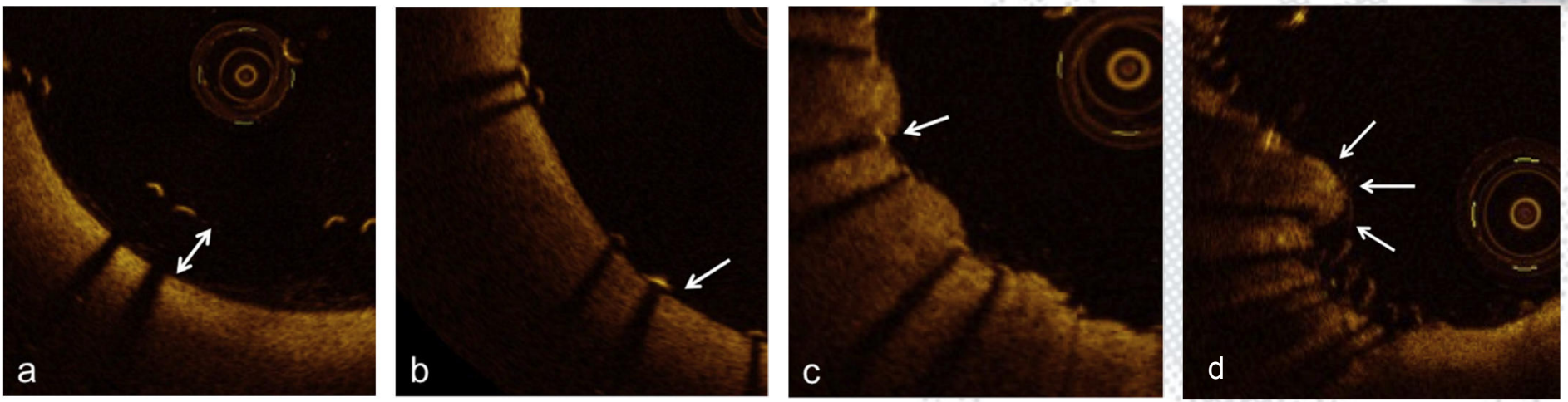
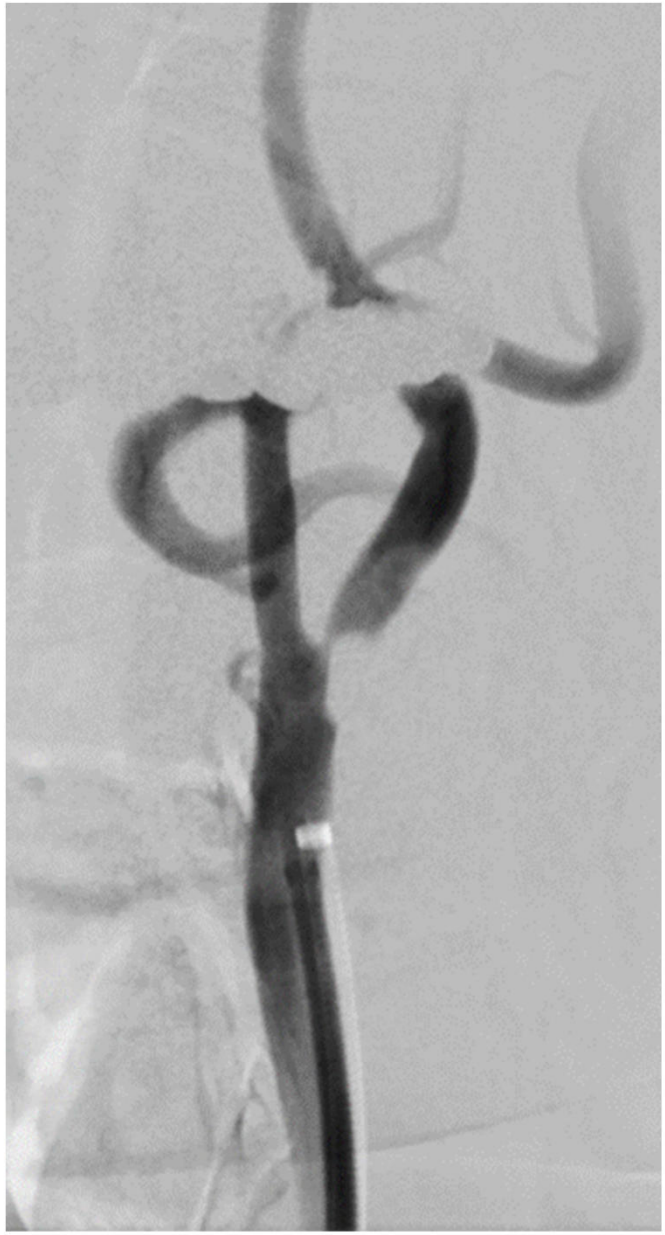
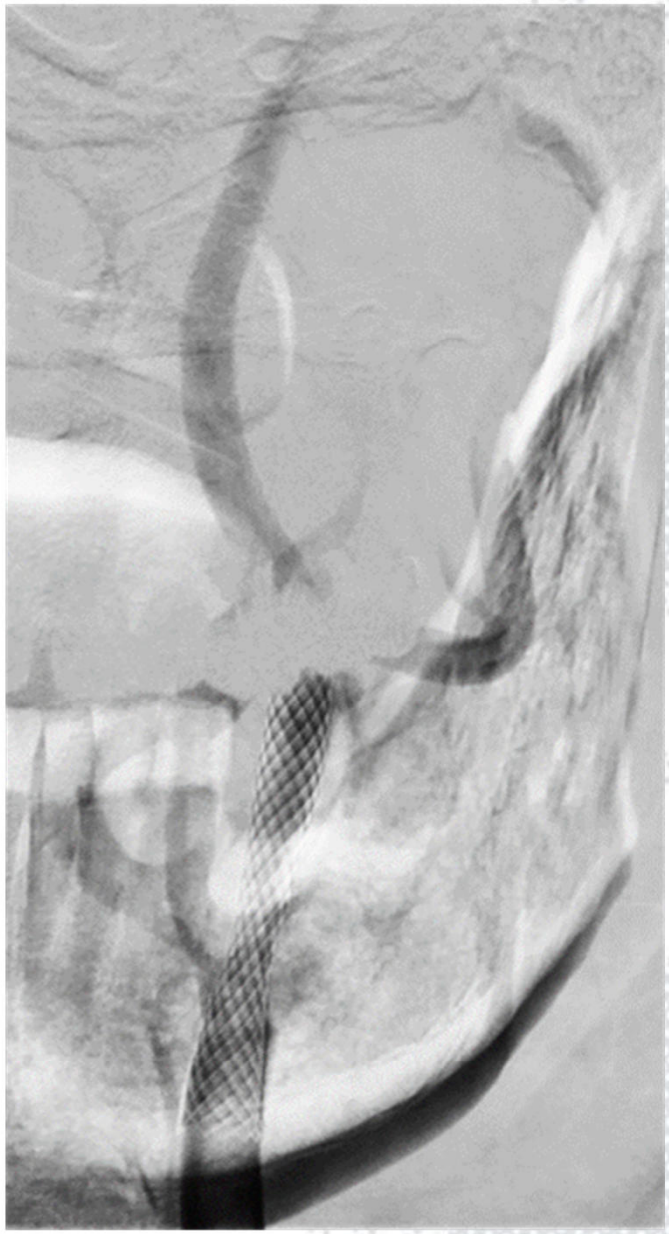


Fig 15. Stent apposition to the arterial wall on a stent strut-based analysis (n = 20412)

	Closed cell (n=8655)	Open cell (n=6654)	Hybrid cell (n=5103)	p-value
malapposed struts	34,5% (2982)	15% (998)	16,3% (833)	CC vs OC p < 0.01 CC vs Hyb p < 0.01 OC vs Hyb p = 0.06
embedded struts	9% (783)	27% (1797)	25,6% (1310)	CC vs OC p < 0.01 CC vs Hyb p < 0.01 OC vs Hyb p = 1
well apposed struts	56,5% (4890)	58% (3859)	58,1% (2960)	CC vs OC p = 0.06 CC vs Hyb p < 0.08 OC vs Hyb p = 1





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80% ICA Stenosis: ViVEXX Stent (open-cell) implantation after failed implantation of Wallstent

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50% symptomatic ICA Stenosis: ViVEXX Stent (open-cell) implantation after failed implantation of Wallstent

key learning points

- Open-cell Stents have higher flexibility and increased anatomy adaptability at the expense of worse lesion coverage
- There is no significant difference in perioperative stroke but a lower risk of restenosis and neurological events for tapered stents at late outcomes.
- Dual-layer mesh stents can be safely used for treatment ICA stenosis but they have a higher risk of acute occlusion in emergency stenting.