

A stylized, dark silhouette of the Eiffel Tower is positioned on the left side of the slide, extending from the bottom left towards the top left.

CONTROVERSES ET ACTUALITÉS EN CHIRURGIE VASCULAIRE
CONTROVERSIES & UPDATES IN VASCULAR SURGERY

JANUARY 25-27 2018



MARRIOTT RIVE GAUCHE & CONFERENCE CENTER, **PARIS, FRANCE**

Intraoperative risk management during asymptomatic carotid repair

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Disclosure

Speaker name:

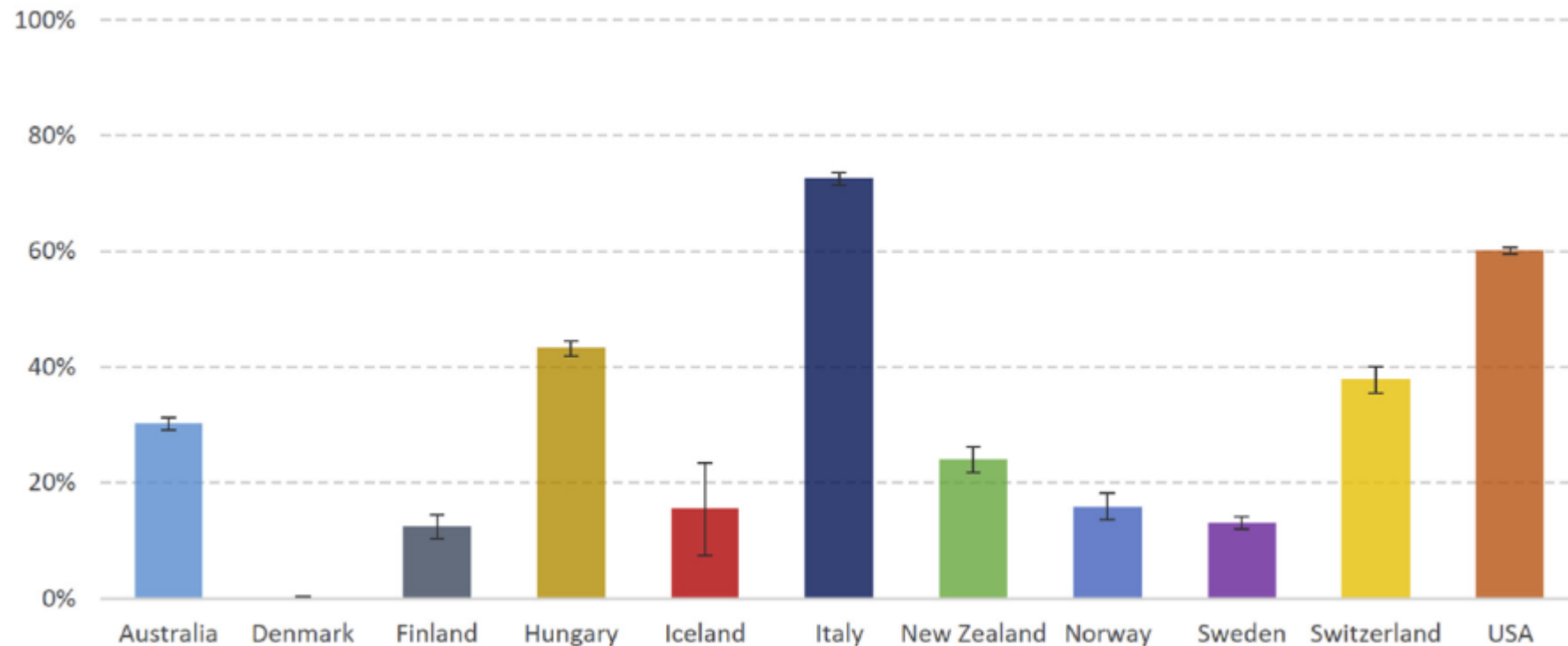
Carlo Pratesi

- ☐ I have the following potential conflicts of interest to report:
 - ☐ Consulting
 - ☐ Employment in industry
 - ☐ Shareholder in a healthcare company
 - ☐ Owner of a healthcare company
 - ☐ Other(s)
- ☒ I do not have any potential conflict of interest



Carotid Stenosis Treatment: Variation in International Practice Patterns

M. Venermo ^{a,*,o}, G. Wang ^{b,o}, A. Sedrakyan ^c, J. Mao ^c, N. Eldrup ^d, R. DeMartino ^e, K. Mani ^f, M. Altreuther ^g, B. Beiles ^h,
G. Menyhei ⁱ, G. Danielsson ^j, I. Thomson ^k, G. Heller ^l, C. Setacci ^m, M. Björck ^{f,p}, J. Cronenwett ^{n,p}





Selection of patients for carotid revascularization

	Perioperative anticipated rate of stroke/mortality Asymptomatic (%)
	1998 3
	2005 3
	2009 3
	2011 3

REVIEW

Stroke/Death Rates Following Carotid Artery Stenting and Carotid Endarterectomy in Contemporary Administrative Dataset Registries: A Systematic Review

K.I. Paraskevas ^{a,*}, E.L. Kalmykov ^b, A.R. Naylor ^b

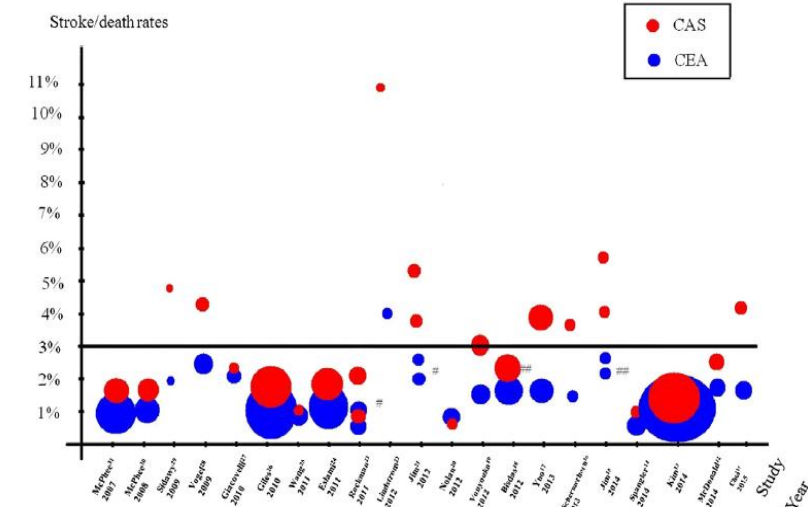
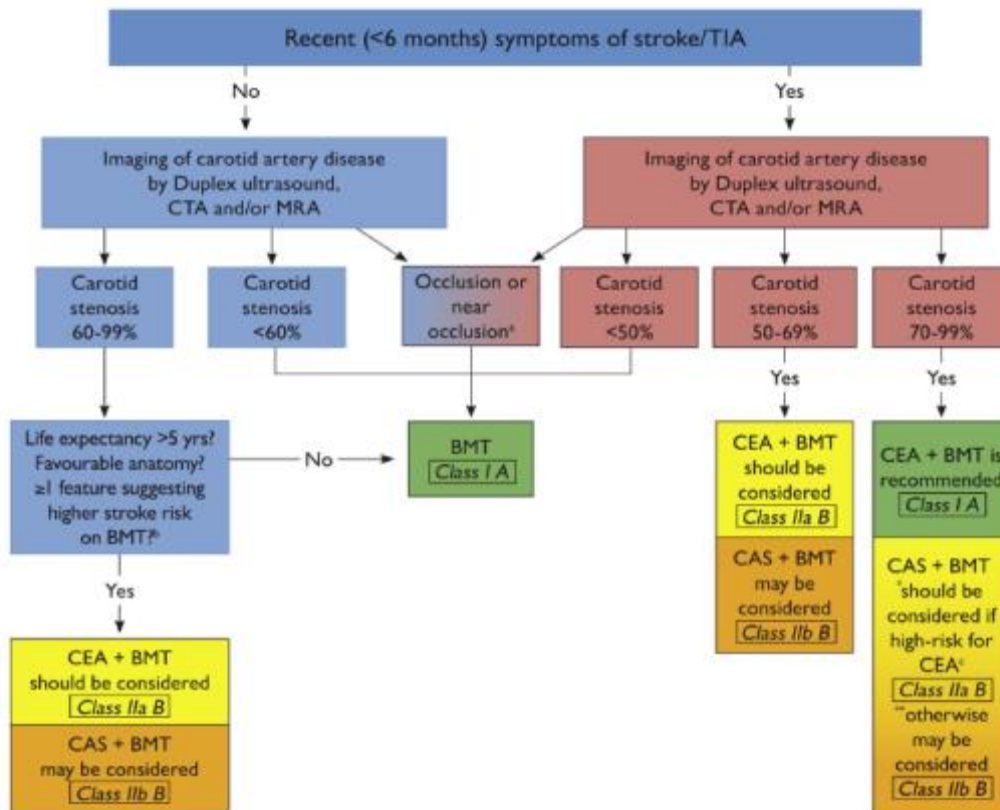


Figure 2. Stroke/death rates for “average risk” asymptomatic patients undergoing CAS and CEA in various registries. [#]Results reported separately for patients aged <65 and ≥65 years. ^{##}Results reported separately for males and females.



Management of Atherosclerotic Carotid and Vertebral Artery Disease: 2017 Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS)



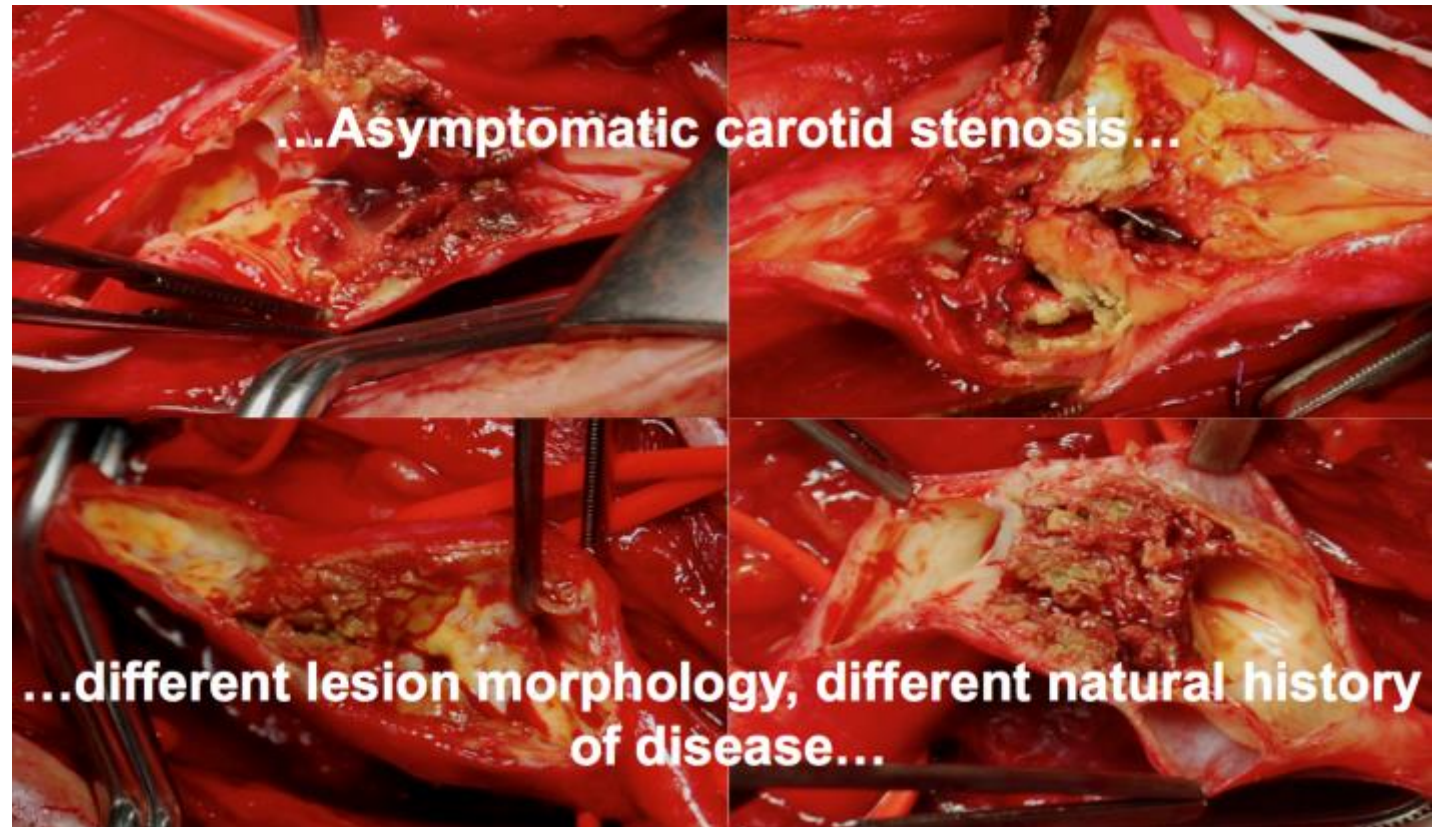
Recommendation 17	Class	Level
In "average surgical risk" patients with an asymptomatic 60–99% stenosis, carotid endarterectomy should be considered in the presence of one or more imaging characteristics that may be associated with an increased risk of late ipsilateral stroke, ^a provided documented perioperative stroke/death rates are <3% and the patient's life expectancy exceeds 5 years	IIa	B

^a Imaging/clinical criteria that might confer an increased risk of stroke on BMT include:

- Silent infarction on CT
- Stenosis progression
- Large plaque area
- Large JBA
- Plaque echolucency
- Intra-plaque haemorrhage on MRI
- Impaired CVR
- Spontaneous embolisation on TCD
- History of contralateral TIA

Risk assessment for treatment options

- ✓ **Surgical team**
- ✓ **Selection of patients:**
 - Lesion characteristics
 - Patient's comorbidities
- ✓ **Surgical technique**





Risk score assessment for treatment options

According to the most recent models, the expected benefit from endarterectomy is marked in patients with a low score (i.e. <4 , corresponding to a periprocedural risk of $<3\%$); marginal in patients with an intermediate score (i.e. 4-7, corresponding to a periprocedural risk of 3-6%); and negligible in patients with a high score (i.e. >7 , corresponding to a periprocedural risk of $>6\%$), in which case the best medical therapy alone should be administered.





Risk index for predicting perioperative stroke, myocardial infarction, or death risk in asymptomatic patients undergoing carotid endarterectomy

<i>Risk factor</i>	<i>Adjusted OR</i>	<i>95% CI</i>	<i>Regression coefficients</i>	<i>Points assigned</i>
Age, years				
<60	Reference	Reference	Reference	0
60-69 (vs <60)	0.75	0.50-1.12	-0.29	-1
70-79 (vs <60)	0.84	0.57-1.24	-0.17	-1
≥80 (vs <60)	1.52	1.03-2.26	0.42	2
Dyspnea at moderate exertion or rest				
No	Reference	Reference	Reference	0
Yes	1.43	1.10-1.86	0.36	2
Previous peripheral revascularization or amputation				
No	Reference	Reference	Reference	0
Yes	1.80	1.33-2.45	0.59	3
COPD				
No	Reference	Reference	Reference	0
Yes	1.73	1.27-2.36	0.55	3
Recent angina within 1 month				
No	Reference	Reference	Reference	0
Yes	2.05	1.21-3.47	0.72	4
Dependent functional status				
No	Reference	Reference	Reference	0
Yes	2.77	1.68-4.58	1.02	5

<i>Total points for the patient</i>	<i>Estimated risk percentage for the patient</i>	<i>Risk tier categorization</i>	<i>N (%)</i>
-1	1.18	Low	15,249 (86.2%)
0	1.44		
1	1.75		
2	2.13		
3	2.6		
4	3.15	Intermediate	2233 (12.6%)
5	3.82		
6	4.63		
7	5.6		
8	6.75	High	210 (1.2%)
9	8.13		
10	9.75		
11	11.66		
12	13.88		
13	16.45		
14	19.38		
15	22.7		
16	26.4		
17	30.47		
18	34.86		
19	39.53		

The 30-day stroke and death incidence after CEA in asymptomatic patients is 1.3% in the United States. A risk index was developed classifying patients into low (<3%), intermediate (3-6%), and high (>6%) risk of 30-day stroke, MI or death.



SCORE	n (%)
-1	365
0	28
1	21
2	204
3	13
4	74
5	45
6	2
7	51
8	7
9	9
10	4
11	3
12	5
13	0
14	0
15	0
16	0
17	0
18	0
19	0
TOT	831

Asymptomatic carotid

Risk stratification- Study group (May 2013-September 2017)

SCORE	n (%)	@ 30 gg	%
LOW	631 (75,9)	1 stroke minor, 1 death (other cause)	0,3
INTERMEDIATE	172 (20,7)	1 stroke minor, 1 death (other cause)	1,1
HIGH	28 (3,4)	1 stroke major, 1 death (other cause)	7,1
totale	831	6	0,7

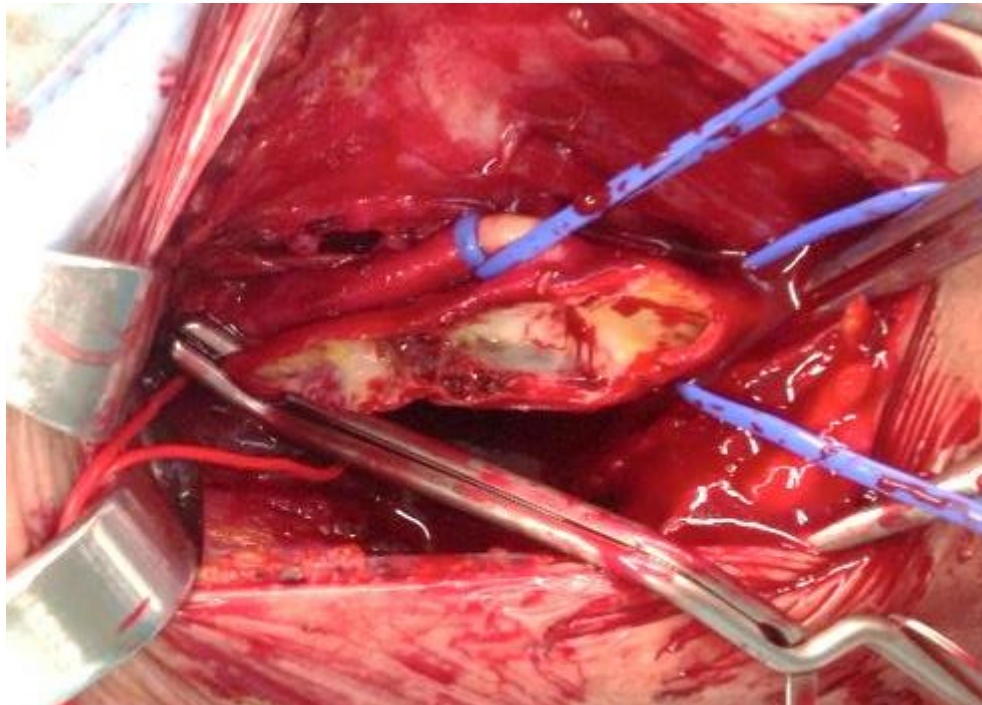
Risk assessment for treatment options

- ✓ Surgical team
- ✓ Selection of patients
- ✓ **Surgical technique**
 - Embolic complications
 - Ischaemic complications



There is More to Preventing Stroke After Carotid Surgery than Shunt and Patch Debates

A.R. Naylor*



- ✓ Best medical therapy
- ✓ Surgical technique
- ✓ Intraoperative imaging
- ✓ Anaesthesia



Process of care for carotid endarterectomy: Perioperative medical management

Michael C. Stoner, MD, and Dorian J. deFreitas, MD, *Greenville, NC*

Table I. Summary of pharmacotherapy strategies for patients undergoing carotid endarterectomy

Strategy	Key points
β -blockade	- Reduces myocardial injury rates following surgery in appropriately selected patients - Low-risk patients likely do not derive a benefit if not already on a β-blocker - May be associated with adverse events at higher doses or if used indiscriminately
ACE inhibitor/ ARB	- Associated with improved long-term survival in patients with peripheral vascular disease - Stabilizes carotid plaque and improve vessel wall biology - Appropriate long-term agent for patients without contraindications
Statin	- Reduces acute and long-term stroke risk, reduces cardiovascular event rate, associated with long-term survival - Multiple mechanisms of action including lipid profile and plaque stabilization - Reasonable agent for all patient undergoing vascular surgery
Antiplatelet	- Reduces acute and long-term stroke risk, reduction in cardiovascular event rate - Low-dose aspirin efficacious - No clear benefit to dual therapy or high-dose therapy in patients undergoing CEA

With the adoption of evidence-based medical therapy, there exists an avenue to optimize the care of patients with carotid disease, to both improve the stroke risk reduction benefit of CEA and the short- and long-term cardiovascular event rate of this at-risk patient population

ACE, Angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CEA, carotid endarterectomy.

J Vasc Surg 2011

Preoperative Antiplatelet and Statin Use Does Not Affect Outcomes after Carotid Endarterectomy

Brianna M. Krafchik,¹ Alik Farber,¹ Robert T. Eberhardt,² Jeffrey A. Kalish,¹ Denis Rybin,³ Gheorghe Doros,³ Steven L. Pike,¹ and Jeffrey J. Siracuse,¹ *Boston, Massachusetts*

Outcomes	Odds Ratio (95% CI)	P value
Postoperative death		
Statin and antiplatelet	0.423 (0.09–1.92)	0.264
Statin only	1.27 (0.25–6.4)	0.78
Antiplatelet only	1.9 (0.46–7.8)	0.37
Cardiac complications		
Statin and antiplatelet	0.87 (0.4–1.9)	0.73
Statin only	0.94 (0.34–2.56)	0.9
Antiplatelet only	0.74 (0.27–2.02)	0.56
Postoperative stroke		
Statin and antiplatelet	1.14 (0.54–2.42)	0.73
Statin only	0.92 (0.34–2.5)	0.88
Antiplatelet only	1.7 (0.76–4.04)	0.19
MACE		
Statin and antiplatelet	0.94 (0.55–1.61)	0.82
Statin only	1.03 (0.52–2.04)	0.93
Antiplatelet only	1.15 (0.61–2.17)	0.66

Outcomes	Odds Ratio (95% CI)	P value
Asymptomatic MACE		
Statin and antiplatelet	1.01 (0.47–2.19)	0.98
Statin only	1.17 (0.48–2.86)	0.72
Antiplatelet only	0.81 (0.35–1.9)	0.63
Symptomatic MACE		
Statin and antiplatelet	0.92 (0.5–1.7)	0.79
Statin only	1.13 (0.53–2.43)	0.75
Antiplatelet only	1.04 (0.53–2.3)	0.91

Preoperative statin and antiplatelet use did not affect perioperative outcomes suggesting that its short-term use is not essential. In patients who are not on statins or antiplatelet medications, CEA can safely be performed before consideration is given to their initiation.

Ann Vasc Surg 2018

Surgical technique: embolic complications

Reducing the Risk of Intraoperative Neurological Complications during Carotid Endarterectomy with Early Distal Control of the Internal Carotid Artery

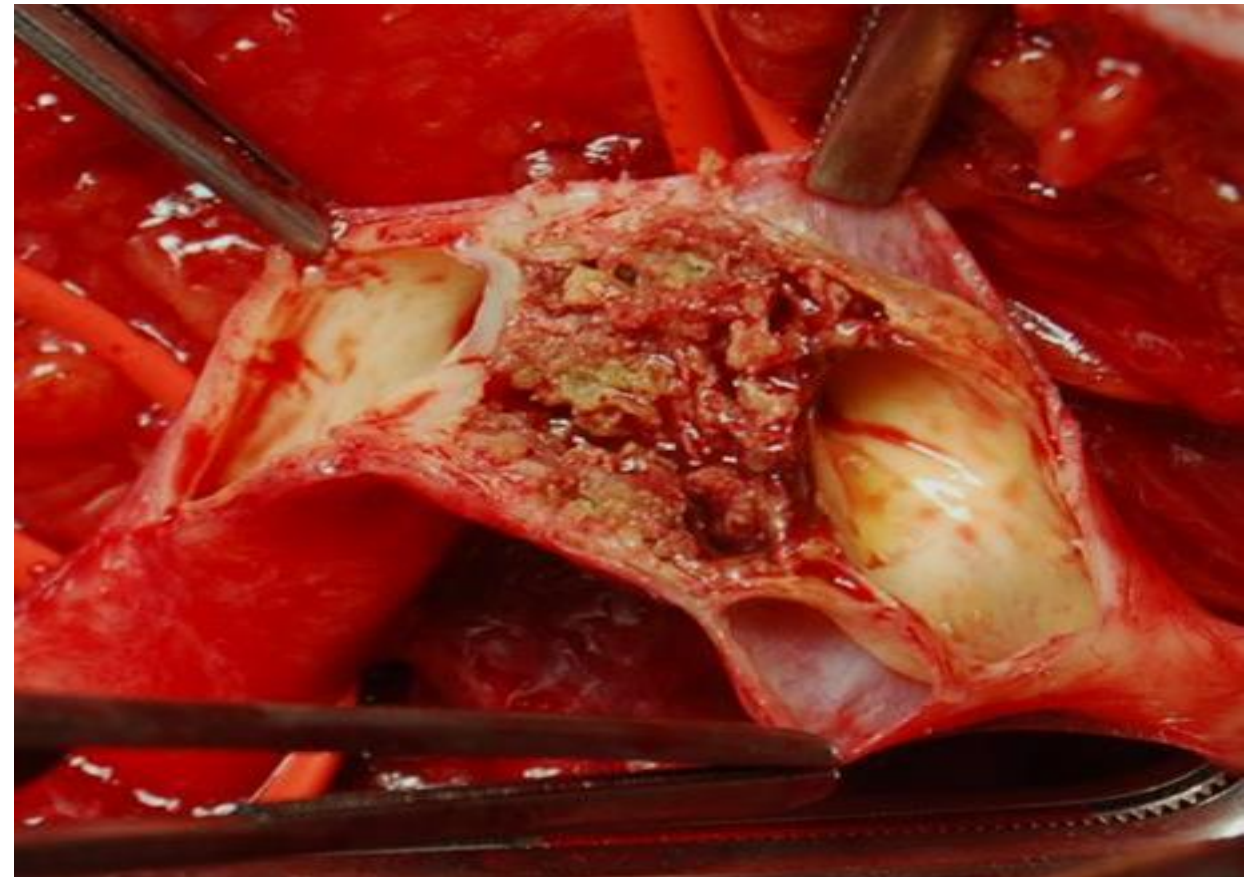


Table 1. Intraoperative features

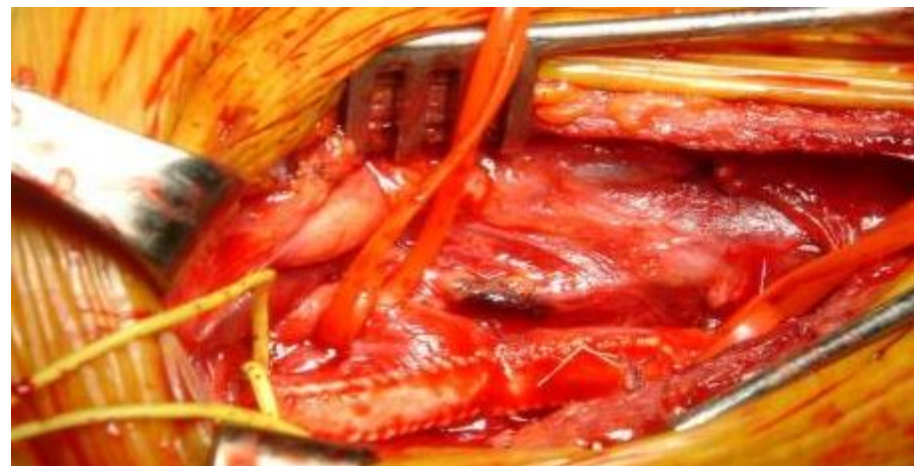
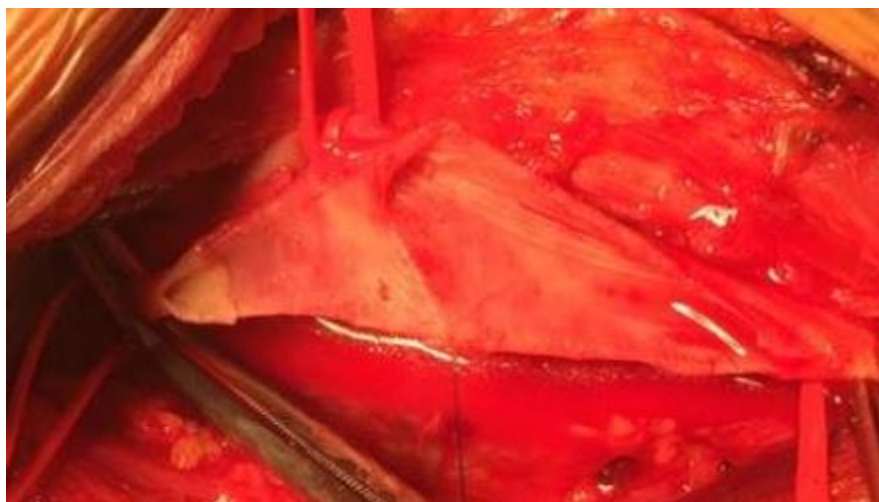
	Group 1	Group 2	<i>p</i>
Patch closure	547 (50.1%)	898 (78.5%)	0.002
Shunt insertion	104 (9.5%)	106 (9.2%)	n.s.
- SEPs reduction	71 (6.5%)	67 (5.8%)	
- SEPs not evaluable	33 (3%)	39 (3.4%)	
Clamping mean duration	28.3 min	33.5 min	<0.001
Deficits at awake	20 (1.8%)	5 (0.4%)	0.002

Early distal clamp

Adverse ischemic cerebral events occurred in 2.4% (TIA) and 2.9% (minor stroke) of patients and were related to significantly more microemboli during dissection (0.92 vs 6.91, $P=0.003$) but not during clamp release or wound closure



Surgical technique

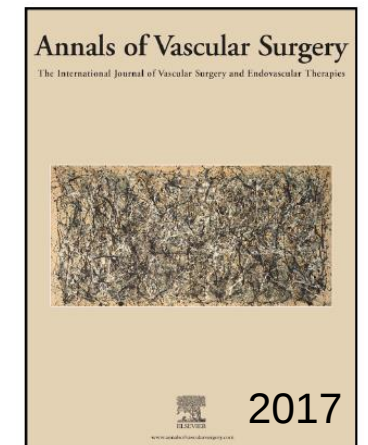
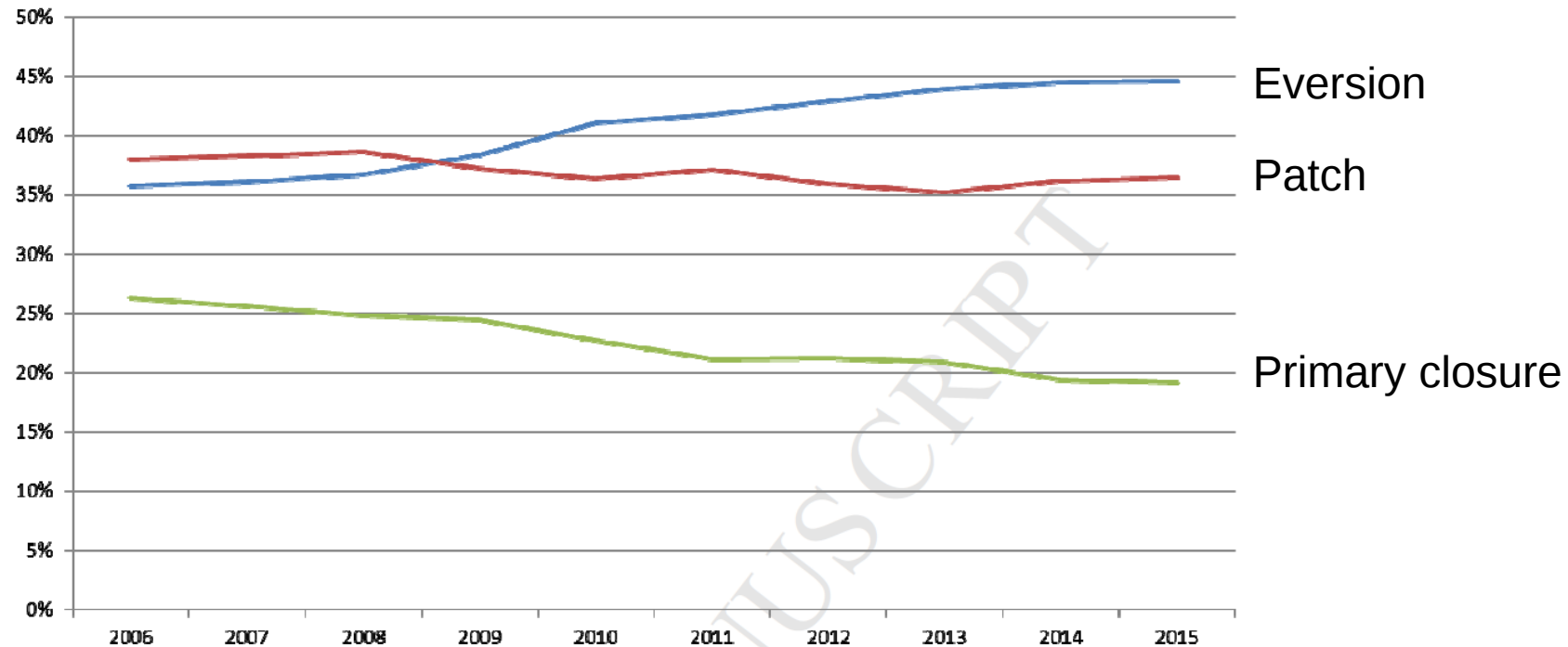




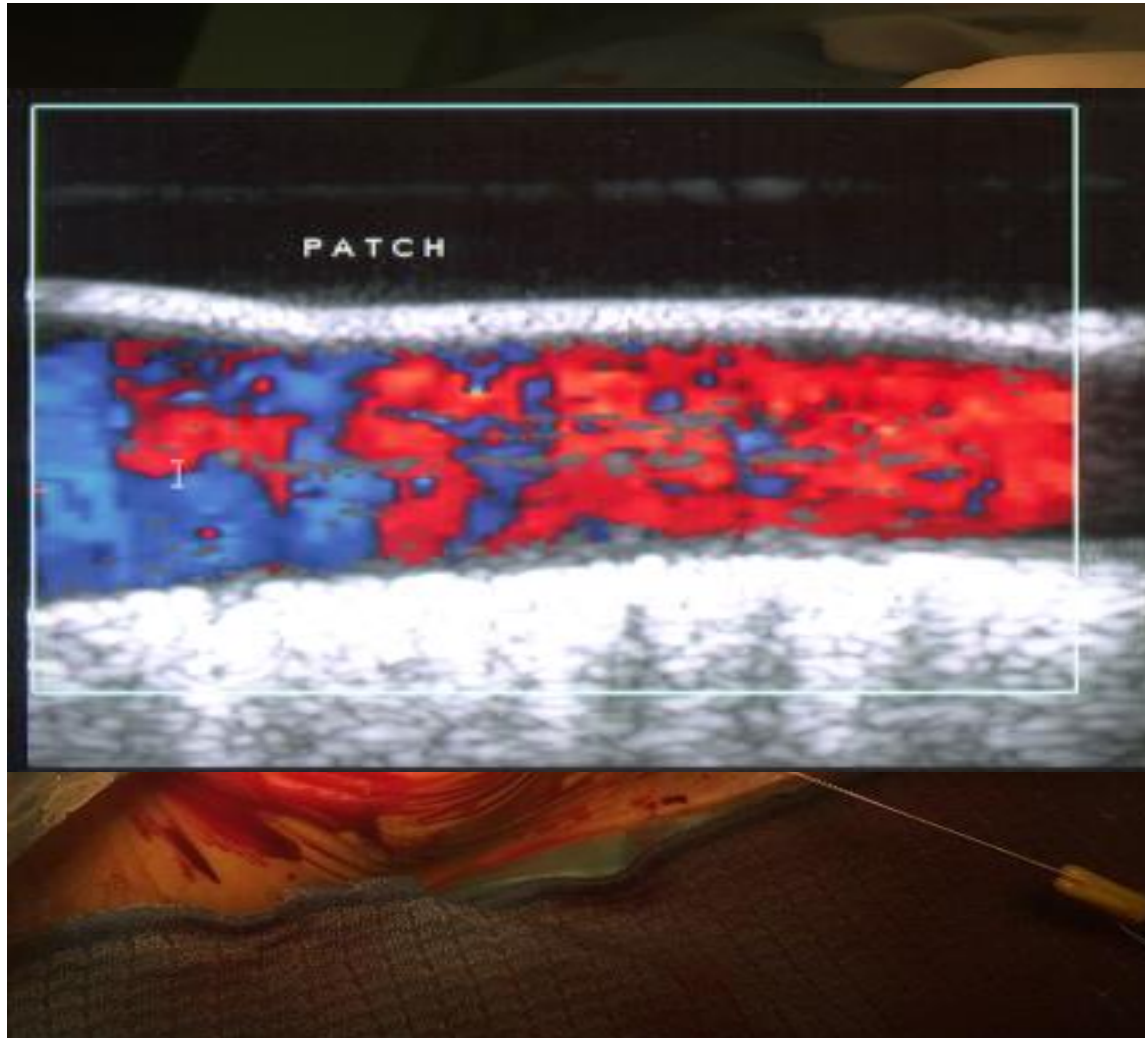
The French experience

Evolution of practices in carotid surgery: observational study in France from 2006 to 2015

Lucie Salomon du Mont, Stefan Olteanu, Eric Steinmetz, Benjamin Kretz



Intraoperative imaging



Prevention of intraoperative neurological events

Embolic complications

- ✓ Surgical technique



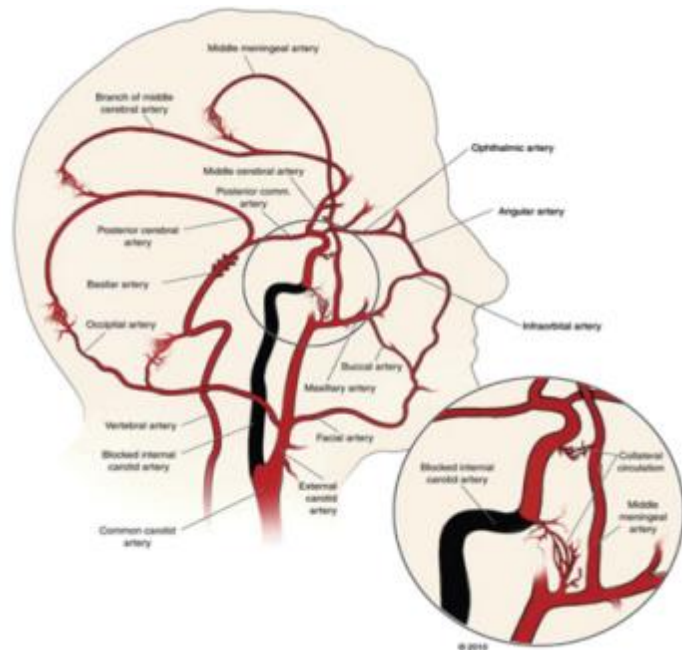
Ischaemic complications

- ✓ Cerebral monitoring (SSEPs, NIRS, awake testing)
- ✓ Accurate pressure control





Intraoperative monitoring of carotid endarterectomy



Apinis et al., Anesth Clin, 2014

Table 1

Overview of the various types of monitors used during carotid endarterectomy to detect cerebral ischemia, thromboembolism, or both

Neurologic Monitor	Description	Advantages	Disadvantages
Awake testing	Using simple tasks for a patient to perform to assess the signs for cerebral ischemia	Direct monitor of neurologic function	Eliminated with CoPaGea
TCD	A Doppler probe is placed on the petrous temporal bone, allowing measurement of MCA flow.	Monitors both flow and emboli, used inter- and postoperative period	- Operator dependent - Placement is near the surgical site. - Acoustic window is not found in 10%–20% of patients.
SP	The SP distal to the carotid clamp reflects the perfusion pressure around the circle of Willis.	Specific measure of cerebral ischemia	- Nonsensitive measure of cerebral ischemia - Cannot identify emboli
EEG	EEG is affected by cerebral ischemia. Raw and processed (spectral array) data can be used.		- Measurement only reflects cortical and not deeper structure. - Difficult to interpret - GA can alter the signal. - Cannot identify emboli
SSEPs	EEG is recorded after a stimulus, thus reflects the cortex and deeper structure activity.	May be useful if baseline EEG is abnormal	- GA can alter the signal. - Thought no more sensitive or specific compared with EEG - Cannot identify emboli
NIRS	NIRS measures arterial venous and capillary oxygenation, producing an rSO_2 value.	High NPV for cerebral ischemia	- Poor PPV - Frontal lobe sensors - Interference from noncerebral blood flow and light - Cannot identify emboli



Anaesthesia

Local vs general anaesthesia

➤ **General anaesthesia versus local anaesthesia for carotid surgery (GALA): a multicentre, randomised controlled trial**

GALA Trial Collaborative Group*

Lancet 2008; 372: 2132-42



No statistical difference was reported between local and general anaesthesia. Different anaesthesiological strategies should be tailored on each case based on team and patient's preference

Anesthesia for Carotid Endarterectomy: The Third Option. Patient Cooperation During General Anesthesia

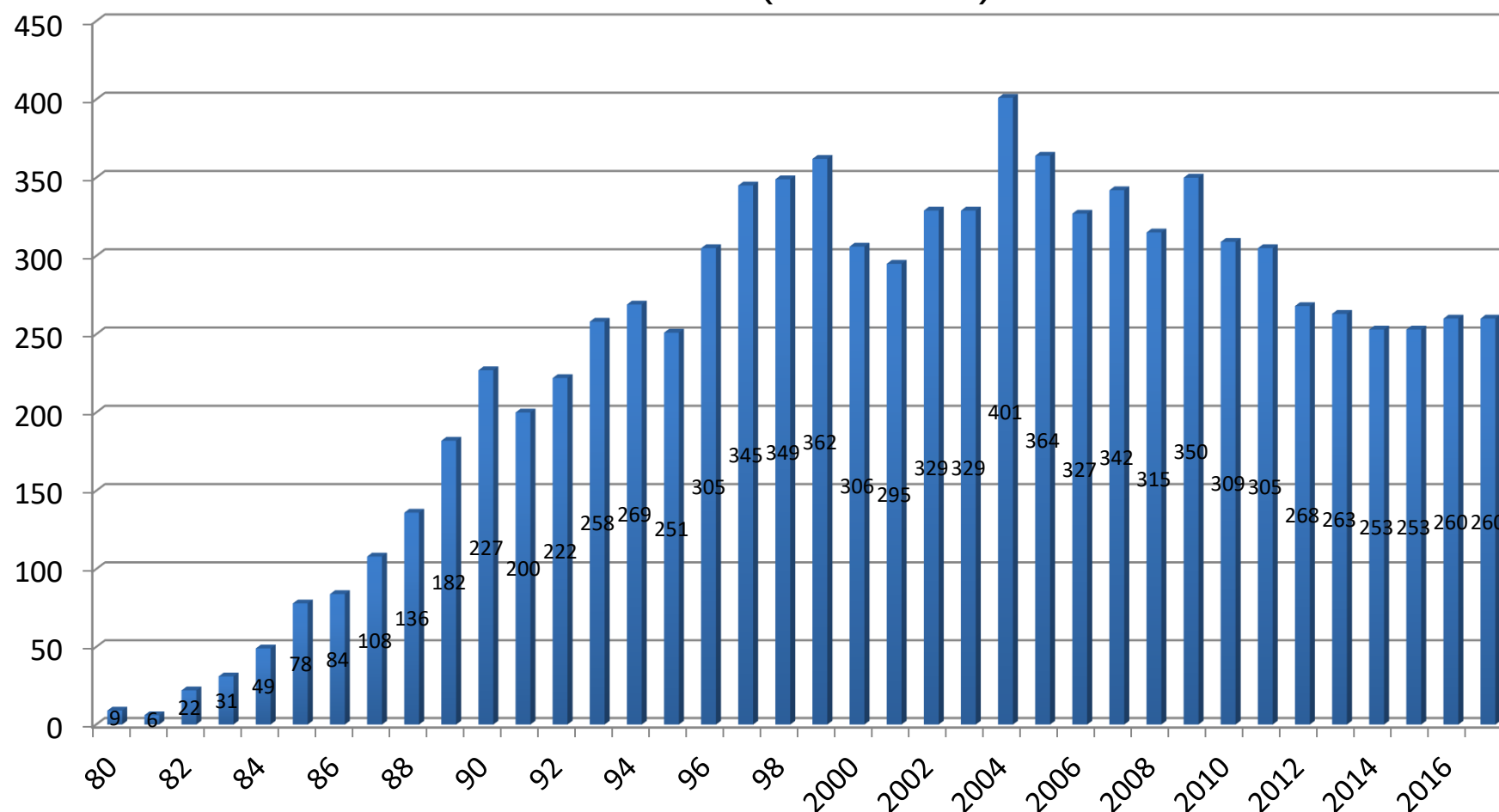
Neurological complications within 30 d:	
Any stroke, <i>n</i> (%)	0
Neuropsychological injury, <i>n</i> (%)	0
Death, <i>n</i> (%)	0
Cardiac complications within 30 days:	
Myocardial infarction, <i>n</i> (%)	2 (1.1)
Arrhythmias, <i>n</i> (%)	2 (1.1) ^a
Death, <i>n</i> (%)	0
Questionnaire on awareness:	
Auditory recalls, <i>n</i> (%)	172 (95.02)
Visual recalls, <i>n</i> (%)	3 (1.66)
Tactile recalls, <i>n</i> (%)	173 (95.58)
Recall of muscular paralysis, <i>n</i> (%)	0
Recall of vocal cord paralysis, <i>n</i> (%)	139 (76.79)
Any recall of pain, <i>n</i> (%)	1 (0.55)
Any recall of bad feelings, <i>n</i> (%)	2 (1.1)
Perception of real length of surgery, <i>n</i> (%)	35 (19.34)
Experienced as a dream, <i>n</i> (%)	106 (58.56)
Patients' satisfaction score, <i>n</i> (%):	
Very satisfied	112 (61.87)
Satisfied	67 (37.01)
Unsatisfied	2 (1.1)
Very unsatisfied	0
Surgeons' satisfaction score, <i>n</i> (%):	
Very satisfied	170 (93.92)
Satisfied	11 (6.08)
Unsatisfied	0
Very unsatisfied	0

Bevilacqua S. et al., Anesth Analg 2009



Dept. Of Vascular Surgery- University of Florence

9026 CEA (1980-2017)



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Prospective study group (1996-2016)

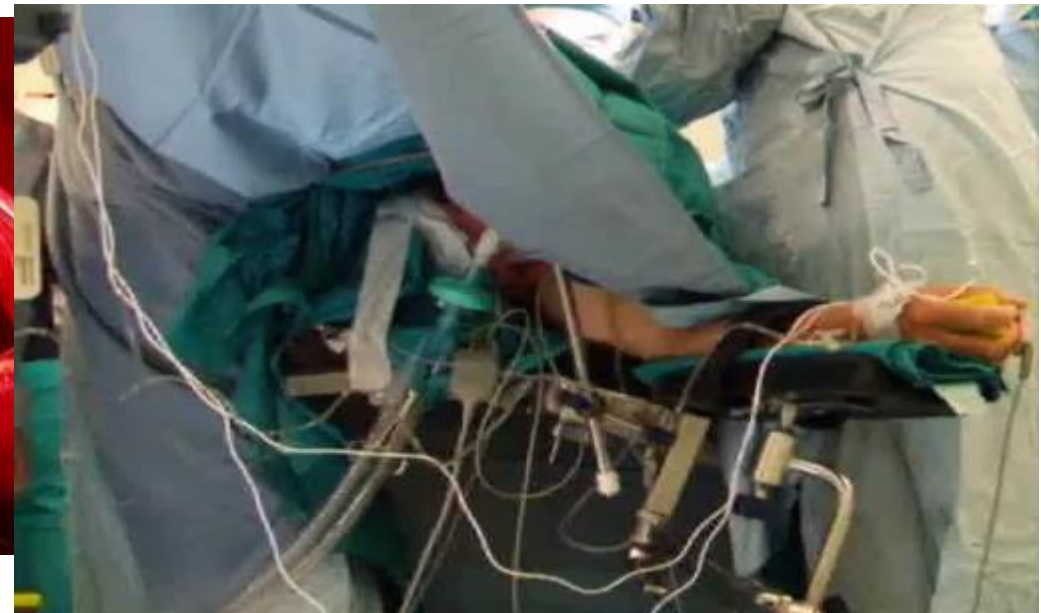
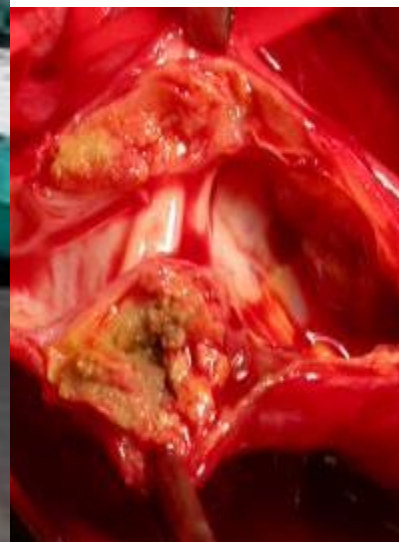
6636 consecutive interventions, 4739 asymptomatics

In the attempt of evaluating the changes in terms of surgical and anesthetic strategy and results in last 20 years, we compared two groups including all the patients operated on between 1996 and 1999 (1321 interventions, Group 1) and between 2013 and 2017 (980 interventions, Group 2)

GA+SSEPs



CoPaGeA (awake monitoring)





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Prospective study group (1996-2016)

SURGICAL AND ANESTHETIC FEATURES

	Group 1 (1321 int.)	Group 2 (980 int.)	p
General anaesthesia	1318 (99.5%)	156 (16%)	<0.001
CoPaGeA (Cooperative Patient General Anesthesia)	-	822 (84%)	<0.001
Selective shunts	85 (6.4%)	144 (14.5%)	<0.001
Arterial reconstruction			
- Primary closure	521 (39.5%)	22 (2%)	<0.001
- Patch	728 (55%)	929 (95%)	<0.001
- Eversion	67 (5%)	26 (2.7%)	0.07
- Bypass graft	5 (0.5%)	3 (0.3%)	n.s.



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Prospective study group (1996-2016)

RESULTS

	Group 1 (1321 int.)	Group 2 (980 int.)	p
Intraoperative neurological events	21 (1.6%)	4* (0.4%)	<0.001

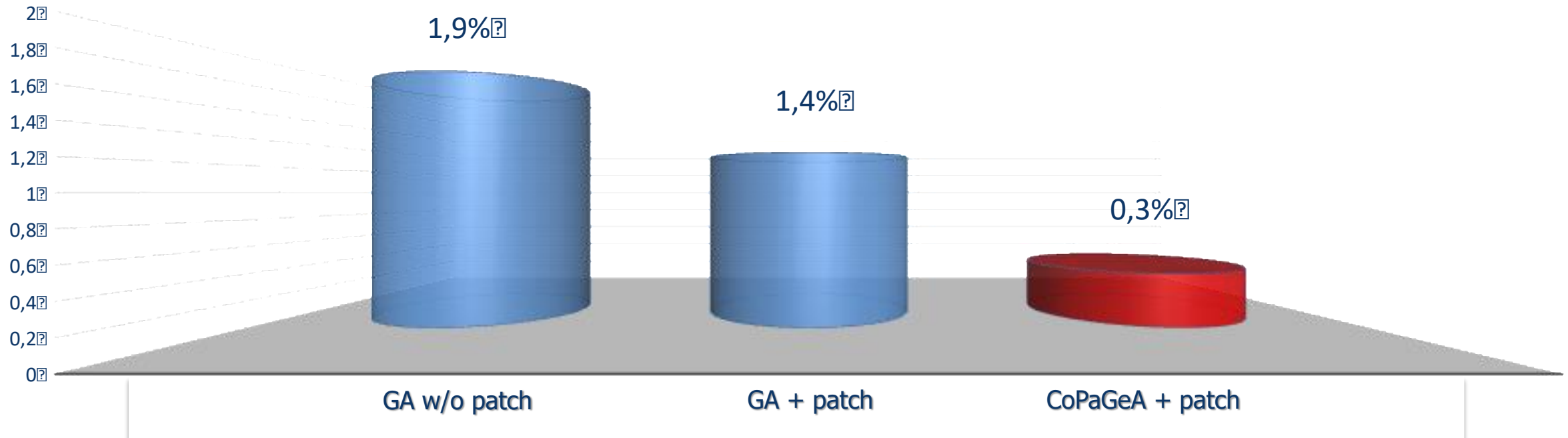
30-day results	Group 1	Group 2	p
Minor stroke	10 (0.8%)	2 (0.2%)	0.05
Maior stroke	3 (0.2%)	1 (0.1%)	n.s.
Deaths	6 (0.4%)	4 (0.4%)	n.s.
Stroke and deaths @ days	19 (1.4%)	7 (0.7%)	0.05

*incomplete recovery after shunting with remission within 3 hours

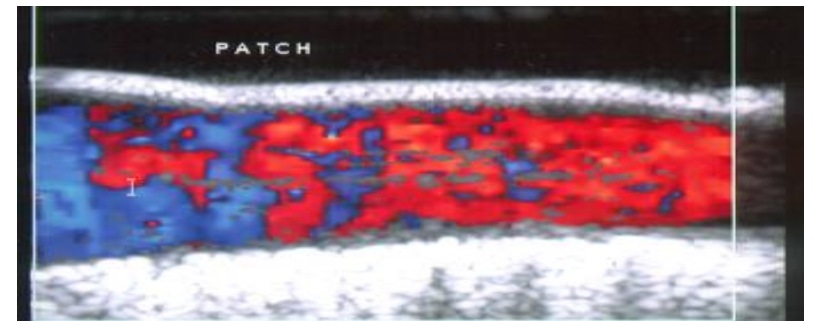


Dept. Of Vascular Surgery-University of Florence Prospective study group (1996-2016)

30-DAY STROKE AND DEATH RATE



How to improve intraoperative results

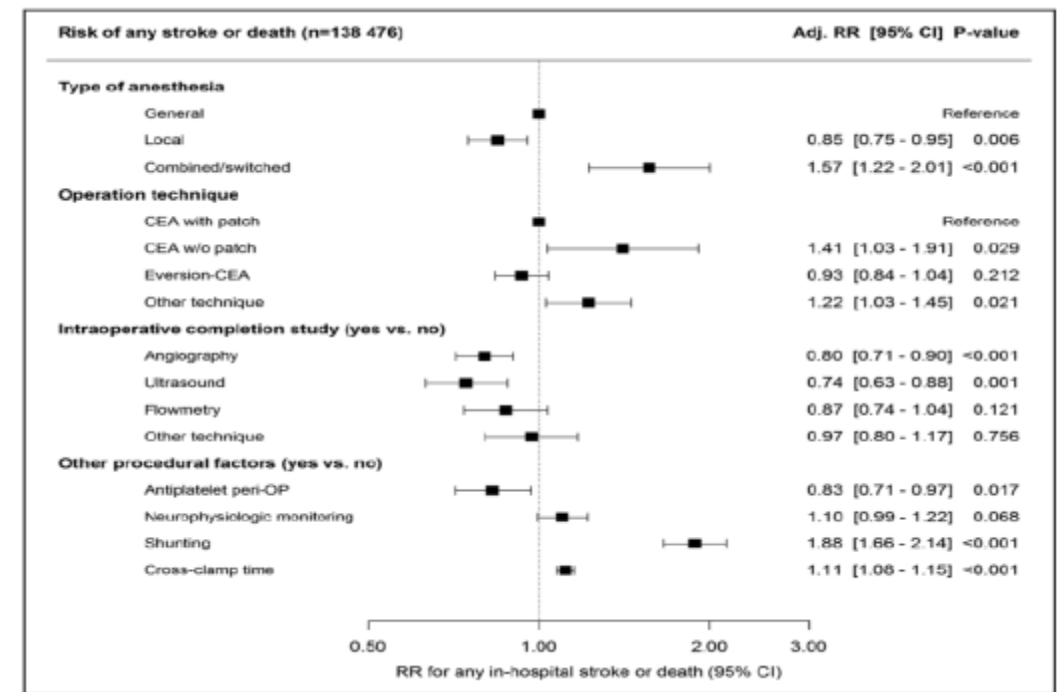


Intraoperative Completion Studies, Local Anesthesia, and Antiplatelet Medication Are Associated With Lower Risk in Carotid Endarterectomy

2009-2014, Germany 142,074 elective carotid endarterectomy procedures for asymptomatic or symptomatic carotid artery stenosis

N=142 074	N	n/N (%)
Type of anesthesia		
Local anesthesia	37 355	26.3
General anesthesia	101 522	71.5
Combined (local/general) anesthesia*	3197	2.3
Intraoperative completion studies†		
Electroencephalography	8230	9.7
Transcranial cerebral oximetry	15 286	18.0
Somatosensory evoked potentials	41 144	48.4
Other methods‡	32 468	38.2
Operation technique		
CEA without patch	1765	1.2
CEA with patch plasty	71 920	50.6
Eversion CEA	60 297	42.4
Other techniques§	8092	5.7
Intra-arterial shunt use	61 074	43.0
Intraoperative completion study	95 044	66.9
Perioperative antiplatelet medication¶	106 653	90.4
ASS monotherapy	97 720	68.8
Other monotherapy	3236	2.3
Dual antiplatelet medication	5697	4.0
None	24 101	17.0

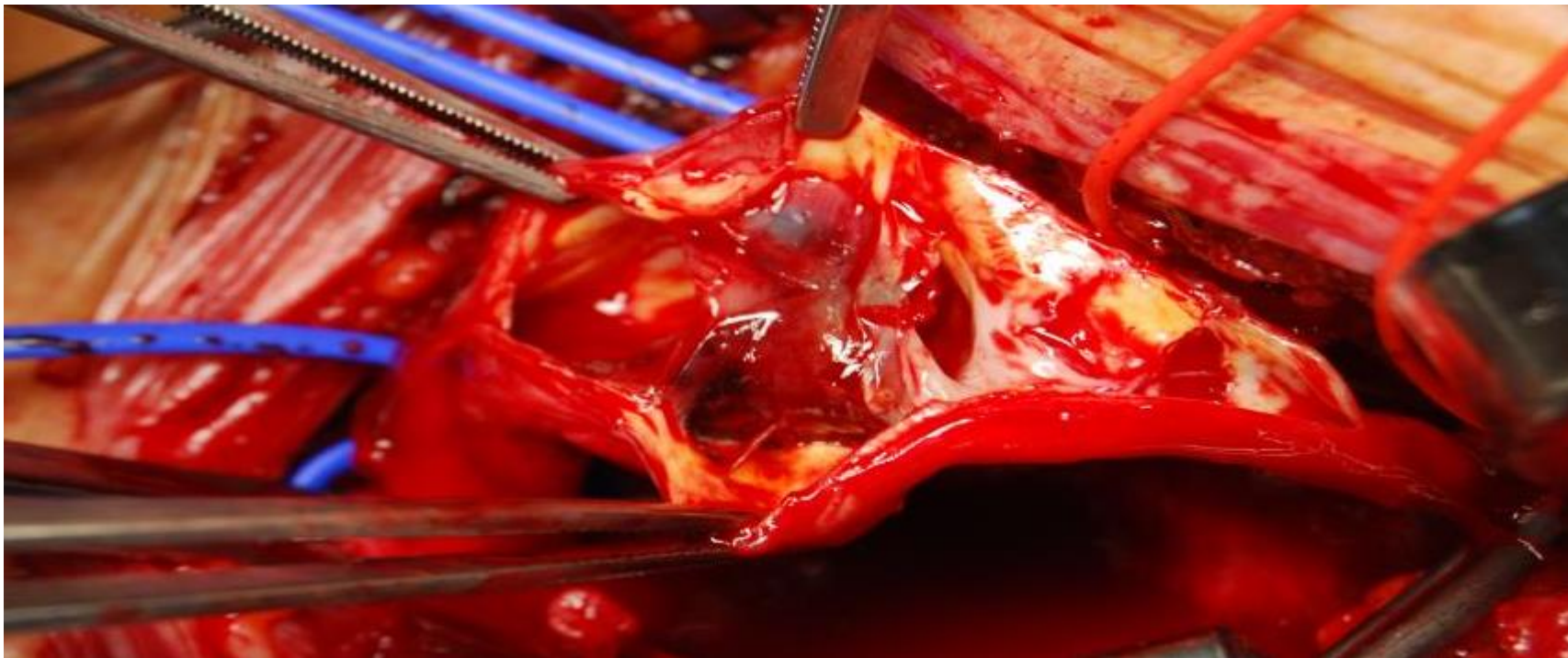
	N	n	n/N (%)	Crude RR	95% CI
Overall	142 074	2611	1.8	...	...
Type of anesthesia					
General anesthesia	101 522	1949	1.9	Ref	...
Local anesthesia	37 355	578	1.5	0.81	0.74–0.88
Both (local/general) anesthesia*	3197	84	2.6	1.37	1.10–1.70
Operation technique					
CEA with patch	71 920	1487	2.1	Ref	...
CEA without patch	1765	52	3.0	1.42	1.09–1.87
Eversion CEA	60 297	878	1.5	0.71	0.65–0.77
Other technique	8092	194	2.4	1.16	1.00–1.34
Intraoperative completion study					
No	47 030	957	2.0	Ref	...
Yes	95 044	1654	1.7	0.86	0.80–0.93
Perioperative antiplatelet medication†					
No	11 320	227	2.0	Ref	...
Yes	106 653	1883	1.8	0.88	0.77–1.01
Any intraoperative neurophysiologic monitoring					
No	56 993	1142	2.0	Ref	...
Yes	84 296	1469	1.7	0.87	0.81–0.94
Intraoperative shunt use					
No	81 000	1131	1.4	Ref	...
Yes	61 074	1480	2.4	1.74	1.61–1.87



LA, patch plasty, intraoperative completion studies (DU-DSA), and perioperative antiplatelet medication were independently associated with lower in-hospital stroke or death rates after carotid endarterectomy

Knappich C. et al., Stroke 2017

Take home message



CEA: prevention of stroke minimizing periprocedural risk < 1%



Intraoperative risk management during asymptomatic carotid repair

- Selection of patients
- Carefull plaque assessment
- Intraoperative risk management



Decision making process



Thank you for your attention

