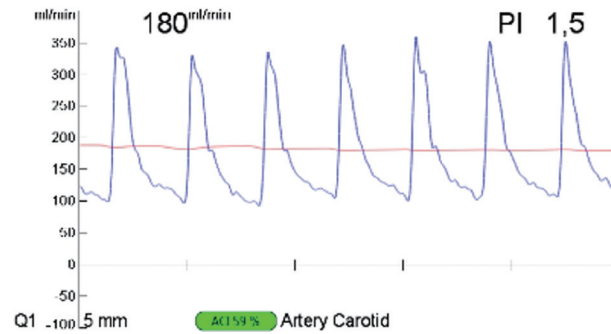
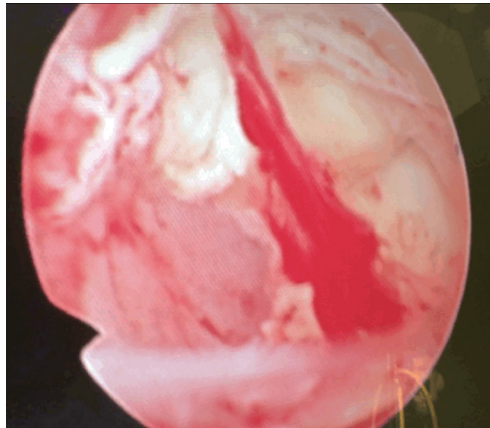


## Supplementary



**Figure S1** Flowmetry. The pulsatility index (PI) is expressed as the ratio of the flow volume amplitude and mean flow volume and serves as an estimate for the peripheral resistance.

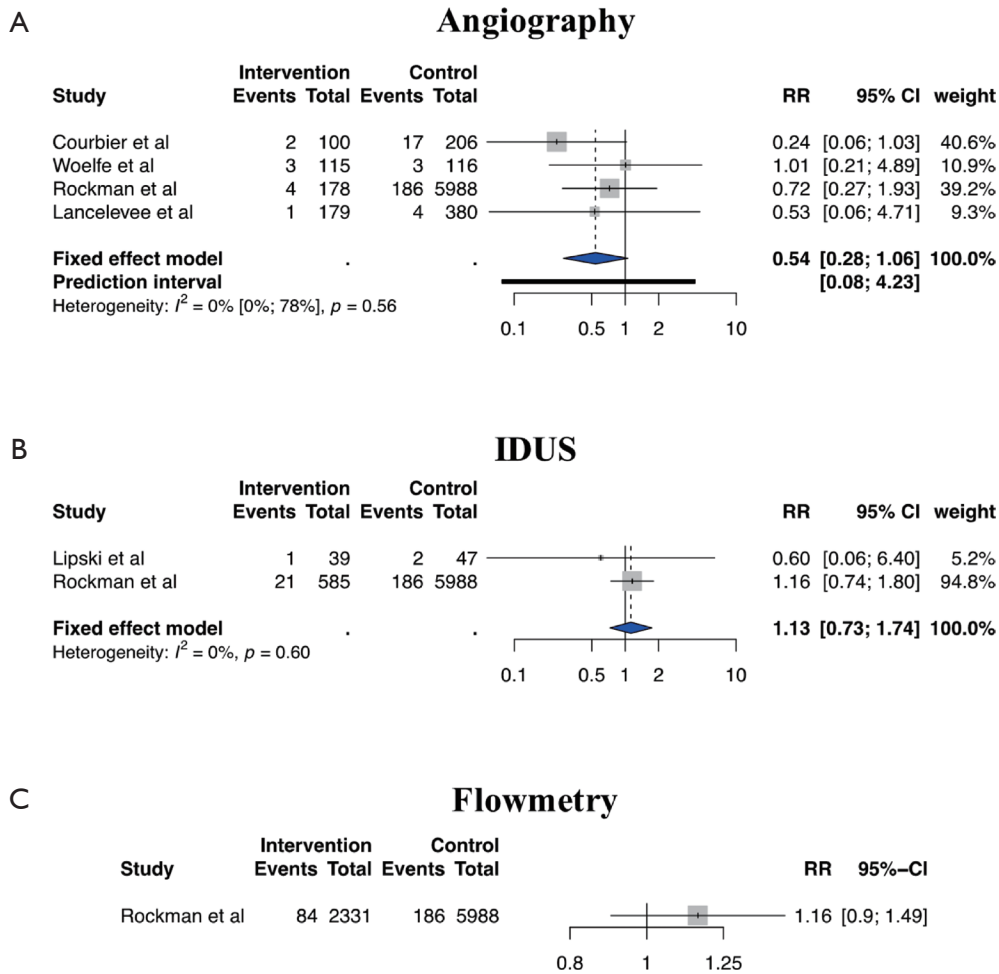


**Figure S2** Angioscopy. Angioscopic image of a retained thrombus attached to the common carotid artery despite previous irrigation with heparinized saline solution. (Kindly provided by Prof. Ross Naylor, Department of Vascular Surgery at Leicester Royal Infirmary, Leicester, United Kingdom).

**Table S1** Clinical studies on intraoperative completion studies in CEA and their study settings and designs (qualitative synthesis)

Studies	Publication year	Patient number	Setting	Study design	Intervention	Outcome measures assessed					
						Periop. stroke	Periop. death	Periop. stroke/death	Surgical revision	Detection of defects	Restenosis during FU
<b>Angiography</b>											
Courbier <i>et al.</i> (26)	1986	100	Single center	n/a	Angio vs. w/o	+	+	+	+	+	+
Bredenberg <i>et al.</i> (27)	1989	50	Single center	n/a	Angio	+	+	+	+	+	+
Donaldson <i>et al.</i> (28)	1993	410	Single center	Prospective	Angio	+	+	+	+	+	+
Lohr <i>et al.</i> (67) <sup>#</sup>	1995	145	Single center	Retrospective	Angio vs. w/o	+	+	+	+	+	-
Branchereau (68) <sup>#</sup>	1995	103	Single center	n/a	Angio and angiography	+	+	+	+	+	-
Westerband <i>et al.</i> (29)	1997	154	Single center	Retrospective	Angio	+	+	+	+	+	+
Zannetti <i>et al.</i> (30)	1999	1004	Multicenter	Prospective	Angio vs. IDUS vs. angiography	+	-	-	+	-	-
Pross <i>et al.</i> (69) <sup>#</sup>	2001	380	Single center	Retrospective	Angio vs. Angio and IDUS vs. IDUS	+	+	+	+	+	+
Woelfle <i>et al.</i> (31)	2002	115	Single center	Prospective	Angio vs. w/o	+	+	-	+	+	+
Valenti <i>et al.</i> (70) <sup>#</sup>	2003	141	Single center	n/a	Angio and IDUS	+	+	+	+	+	-
Pratesi <i>et al.</i> (32)	2006	430	Single center	Prospective	Angio vs. selective angio	+	+	+	+	-	+
Rockman <i>et al.</i> (33)	2007	178	Registry	Retrospective	Any vs. angio vs. doppler vs. IDUS vs. w/o	+	+	+	-	-	-
Winkler <i>et al.</i> (62) <sup>#</sup>	2007	116	Single center	n/a	Angio and IDUS and flowmetry	+	+	+	+	+	+
Ricco <i>et al.</i> (34)	2011	1179	Single center	Prospective	Angio	+	+	+	+	+	+
Lancelevee <i>et al.</i> (35)	2013	179	Single center	Retrospective	Angio vs. w/o	+	+	-	+	+	+
Knappich <i>et al.</i> (11)	2017	51,219	Registry	Retrospective	Angio vs. IDUS vs. Flowmetry vs. w/o	-	-	+	-	-	-
Wieker <i>et al.</i> (36)	2019	827	Single center	Retrospective	Angio	+	+	+	+	-	+
<b>IDUS</b>											
Schwartz <i>et al.</i> (37)	1988	79	Single center	Prospective	IDUS	+	+	+	+	+	-
Sawchuk <i>et al.</i> (38)	1989	80	Single center	n/a	IDUS	+	+	+	+	+	+
Kinney <i>et al.</i> (71) <sup>#</sup>	1993	410	Single center	Prospective	IDUS vs. IDUS and angio vs. w/o	+	+	+	+	+	+
Hoff <i>et al.</i> (72) <sup>#</sup>	1994	44	Single center	Prospective	IDUS vs. IDUS and angio	+	-	-	+	+	+
Brandyk <i>et al.</i> (39)	1994	210	Single center	n/a	IDUS	+	-	-	-	+	-
Baker <i>et al.</i> (40)	1994	316	Single center	Retrospective	IDUS	+	+	+	+	+	+
Lingenfelter <i>et al.</i> (61) <sup>#</sup>	1995	53	Single center	Prospective	Angio and IDUS and flowmetry	+	+	-	+	+	+
Yu <i>et al.</i> (41)	1996	35	Single center	n/a	IDUS	+	-	-	+	+	-
Papanicolaou <i>et al.</i> (42)	1996	86	Single center	Prospective	IDUS	+	-	-	+	+	+
Lipski <i>et al.</i> (43)	1996	39	Single center	Retrospective	IDUS vs. w/o	+	+	+	+	+	+
Walker <i>et al.</i> (44)	1996	50	Single center	n/a	IDUS	+	+	+	+	+	-
Dorffner (45)	1997	50	Single center	Prospective	IDUS	+	-	-	+	+	-
Steinmetz <i>et al.</i> (46)	1998	100	Single center	Retrospective	IDUS	+	+	+	+	+	-
Payadachee <i>et al.</i> (47)	1998	106	Single center	n/a	IDUS	+	+	+	+	+	-
Seelig <i>et al.</i> (48)	1999	102	Single center	Retrospective	IDUS	+	+	+	+	+	+
Mays <i>et al.</i> (17)	2000	100	Single center	Prospective	IDUS	+	+	+	+	+	+
Pross <i>et al.</i> (69) <sup>#</sup>	2001	380	Single center	Retrospective	Angio vs. Angio and IDUS vs. IDUS	+	+	+	+	+	+
Panneton <i>et al.</i> (49)	2001	155	Single center	Retrospective	IDUS	+	+	+	+	+	-
Ascher <i>et al.</i> (50)	2002	197	Single center	Prospective	IDUS	+	+	+	+	+	-
Mullenix <i>et al.</i> (19)	2002	100	Single center	Retrospective	IDUS	+	+	+	+	+	+
Padayachee <i>et al.</i> (51)	2002	244	Single center	Prospective	IDUS	+	+	+	+	+	+
Valenti <i>et al.</i> (70) <sup>#</sup>	2003	141	Single center	Prospective	Angio and IDUS	+	+	+	+	+	-
Ascher <i>et al.</i> (15)	2004	650	Single center	n/a	IDUS	+	+	+	+	+	-
Winkler <i>et al.</i> (62) <sup>#</sup>	2007	116	Single center	n/a	IDUS and flowmetry and angio	+	+	+	+	+	+
Schanzer <i>et al.</i> (18)	2007	407	Single center	Retrospective	IDUS	+	+	+	+	+	+
Rockman <i>et al.</i> (33)	2007	585	Registry	Retrospective	Any vs. angio vs. doppler vs. IDUS vs. w/o	+	+	+	-	-	-
Ott <i>et al.</i> (52)	2008	74	Single center	Prospective	IDUS	+	+	+	+	-	-
Yuan <i>et al.</i> (53)	2014	285	Single center	Retrospective	IDUS	+	+	+	+	+	+
Knappich <i>et al.</i> (11)	2017	18,889	Registry	Retrospective	Angio vs. IDUS vs. flowmetry vs. w/o	-	-	+	-	-	-
<b>Flowmetry</b>											
Bandyk <i>et al.</i> (73) <sup>#</sup>	1988	235	Single center	Prospective	Angio and flowmetry	+	+	+	+	+	+
Rockman <i>et al.</i> (33)	2007	2,331	Registry	Retrospective	Any vs. angio vs. doppler vs. IDUS vs. w/o	+	+	+	-	-	-
Knappich <i>et al.</i> (11)	2017	18,878	Registry	Retrospective	Angio vs. IDUS vs. flowmetry vs. w/o	-	-	+	-	-	-
<b>Angioscopy</b>											
Gaunt <i>et al.</i> (54)	1994	30	Single center	Retrospective	Angioscopy	+	-	-	+	-	-
Branchereau (68) <sup>#</sup>	1995	103	Single center	n/a	Angio and angiography	+	+	+	+	+	-
Zannetti <i>et al.</i> (30)	1999	299	Multicenter	Prospective	Angio vs. IDUS vs. angiography	+	-	-	+	-	+
Lennard <i>et al.</i> (55)	1999	252	Single center	Prospective	Angioscopy	+	+	+	+	+	-
Osman <i>et al.</i> (23)	2001	110	Single center	Retrospective	Angioscopy	+	+	+	+	+	-
Sharpe <i>et al.</i> (21)	2012	1,600	Single center	Retrospective	Angioscopy	+	+	+	+	-	-

<sup>#</sup> indicates exclusion from quantitative study as study outcomes not attributable to one specific intraoperative completion study technique. Periop. indicates perioperative; FU, follow up; n/a, not available; angio, angiography; IDUS, intraoperative duplex ultrasound; w/o, nonapplication of any intraoperative completion study; +, outcome measure assessed for; -, outcome measure not assessed for.



**Figure S3** Meta-analysis of all publications comparing perioperative stroke rates in patients undergoing CEA with different intraoperative completion studies (ICS) to those treated with CEA without any ICS. Forest plots illustrating results of meta-analyses including all studies to compare CEA with angiography (A), IDUS (B), and flowmetry (C) to CEA without use of any ICS. CEA, carotid endarterectomy; IDUS, intraoperative duplex ultrasound; RR, risk ratio; CI, confidence interval.

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