

ON-LINE APPENDIX: SYSTEMATIC REVIEW SEARCH STRATEGY

The primary inclusion criteria were the following:

I) Studies proposing or using “quantitative” classification methods or grading scales to describe the amount of arterial narrowing or vasospasm in human brain following subarachnoid hemorrhage

II) Articles denoting interobserver reports of reliability using CT angiography as a diagnostic technique by any “quantitative” grading scale to measure the degree of cerebral vasospasm using κ statistics

A) Inclusions:

I) Clinical study

II) Original research

III) Adult human subjects

IV) Report of interobserver reliability presented in result section

B) Exclusions:

I) Duplicate studies

II) Other than French and English languages

III) Subjects without SAH or cerebral vasospasm; non-imaging modalities; pathogenesis, physiologic, etiologic, disease associations, and animal and in vitro studies

IV) Review articles, letters, editorials, commentaries, case reports, protocols, and guidelines

V) SAH outcomes other than vasospasm detection, (ie, treatment strategies, mortality, morbidity, prognosis, costs, quality of life)

VI) Studies on treatment of vasospasm

VII) Case reports

VIII) Detection of cerebral vasospasm by any technique other than CT angiography

IX) Accuracy and intermodality studies

X) Studies using statistical methodologies other than κ statistics for measuring interobserver agreement.

On-line Table 1: Search CINAHL database (EBSCO interface) up to May 3, 2018

Step	Question	Results
S1	(MH “Cerebral Vasospasm”) OR (intraluminal N2 narrowing) OR vasospasm* OR (intraluminal N2 narrowing) OR (luminal N2 reduction) OR (luminal N2 narrowing) OR (narrowing N2 constriction) OR vasoconstriction	4737
S2	((MH “Subarachnoid Hemorrhage”) OR (MH “Subarachnoid Hemorrhage Precautions (Iowa NIC)”) OR SAH OR (subarachnoid N2 hemorrhage*) OR (subarachnoid N2 hemorrhage*))	5318
S3	(MH “Cerebral Aneurysm”) OR (MH “Intracranial Hemorrhage”) OR (MH “Cerebral Hemorrhage”)	10,701
S4	((Intracranial or Cerebral or brain ruptur*) N2 aneurysm*)	3712
S5	S2 OR S3 OR S4	14,928
S6	((MH “Reproducibility of Results”) OR (MH “Sensitivity and Specificity”) OR (MH “Interrater Reliability”) OR (MH “Reliability”)) OR (agreement or reliability or reproducibility or repeatability or variability or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or accuracy or specificity or sensitivity)	338,968
S7	(MH “Prospective Studies”) OR (MH “Cerebral Angiography”) OR (MH “Image Processing, Computer Assisted”) OR (MH “Cerebral Ischemia, Transient/DI/ET”) OR (MH “Tomography, X-Ray Computed”) OR (MH “Angiography”)	441,250
S8	(angiograph* or diagnostic imaging or Tomograph*)	169,687
S9	S6 OR S7 OR S8	780,700
S10	S1 AND S5 AND S9	541

On-line Table 2: Search EBM reviews (OvidSP interface) up to May 3, 2018

Step	EBM Reviews ^a	
	Question	Results
S1	(intraluminal adj2 narrowing).tw,sh,kw.	0
S2	vasospasm*.tw,sh,kw.	846
S3	(intraluminal adj2 narrowing).tw,sh,kw.	2
S4	(luminal adj2 reduction).tw,sh,kw.	46
S5	(luminal adj2 narrowing).tw,sh,kw.	86
S6	(narrowing adj2 constriction).tw,sh,kw.	3
S7	vasoconstriction*.tw,sh,kw.	2040
S8	Vasospasm, Intracranial/	120
S9	brain vasospasm/	0
S10	or/1–9	2970
S11	Subarachnoid Hemorrhage/ or brain artery aneurysm rupture/ or aneurysm rupture/ or brain artery aneurysm/ or intracranial aneurysm/	654
S12	SAH.tw,sh,kw.	632
S13	subarachnoid hemorrhage/	450
S14	(subarachnoid adj2 h?emorrhage*).tw,sh,kw.	1609
S15	((Intracranial or Cerebral or brain ruptur*) adj2 aneurysm*).tw,sh,kw.	801
S16	or/11–15	2265
S17	(agreement or reliability or reproducibility or repeatability or variability or interobserver or interreader or interrater or interassessor or interreviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interreviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interreviewer or interexaminer or interevaluator or interoperator or accuracy or specificity or sensitivity).tw, kw,sh.	105,520
S18	Observer Variation/	2029
S19	“Reproducibility of Results”/	11,245
S20	“Sensitivity and Specificity”/	10,530
S21	Data Accuracy/ or prospective study/	9
S22	reproducibility/	0
S23	accuracy/	1
S24	reliability/	0
S25	reproducibility/	0
S26	interrater reliability/	0
S27	brain angiography/ or image processing/ or transient ischemic attack/di or x-ray CT/ or Ischemic Attack, Transient/et or angiography/	6525
S28	(angiograph* or diagnostic imaging or Tomograph*).tw,kw,sh.	32,617
S29	or/17–28	138,802
S30	10 and 16 and 29	284

^a EBM reviews: Cochrane Database of Systematic Reviews 2005 to May 2, 2018; ACP Journal Club 1991 to April 2018; Database of Abstracts of Review of Effects first quarter; Cochrane Clinical Answers March 2018; Cochrane Central Register of Controlled Trials March 2018; Cochrane Methodology Register third quarter 2012; Health Technology Assessment fourth quarter 2016; National Health Service Economic Evaluation Database first quarter 2016.

On-line Table 3: Search EMBASE database (OvidSP interface) up to May 3, 2018

Step	Question	Results
S1	(intraluminal adj2 narrowing).tw,sh,kw.	0
S2	vasospasm*.tw,sh,kw.	18,533
S3	(intraluminal adj2 narrowing).tw,sh,kw.	41
S4	(luminal adj2 reduction).tw,sh,kw.	520
S5	(luminal adj2 narrowing).tw,sh,kw.	2836
S6	(narrowing adj2 constriction).tw,sh,kw.	17
S7	vasoconstriction*.tw,sh,kw.	50,734
S8	Vasospasm, Intracranial/	4311
S9	brain vasospasm/	6,566
S10	or/1–9	72,401
S11	Subarachnoid Hemorrhage/ or brain artery aneurysm rupture/ or aneurysm rupture/ or brain artery aneurysm/ or intracranial aneurysm/	67,982
S12	SAH.tw,sh,kw.	13,613
S13	subarachnoid hemorrhage/	38,931
S14	(subarachnoid adj2 h?emorrhage*).tw,sh,kw.	30,563
S15	((Intracranial or Cerebral or brain ruptur*) adj2 aneurysm*).tw,sh,kw.	21,596
S16	or/11–15	75,752
S17	(agreement or reliability or reproducibility or repeatability or variability or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interreviewer or interexaminer or interevaluator or interoperator or accuracy or specificity or sensitivity or agreement or reliability or reproducibility or repeatability or variability or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interreviewer or interexaminer or interevaluator or interoperator or accuracy or specificity or sensitivity).tw, kw,sh.	2,312,298
S18	Observer Variation/	18,881
S19	"Reproducibility of Results"/	152,153
S20	"Sensitivity and Specificity"/	292,660
S21	Data Accuracy/ or prospective study/	470,764
S22	reproducibility/	190,295
S23	accuracy/	158,680
S24	reliability/	122,914
S25	reproducibility/	190,295
S26	interrater reliability/	9548
S27	brain angiography/ or image processing/ or transient ischemic attack/di or x-ray CT/ or Ischemic Attack, Transient/et or angiography/	211,382
S28	(angiograph* or diagnostic imaging or Tomograph*).tw,kw,sh.	816,572
S29	or/17–28	3,523,170
S30	10 and 16 and 29	4306
S31	limit 30 to EMBASE	3373

On-line Table 4: Search MEDLINE (OvidSP interface) up to May 3, 2018

Step	Question	Results
S1	Vasospasm, Intracranial/	2873
S2	(intraluminal adj2 narrowing).tw,sh,kw.	1
S3	vasospasm*.tw,sh,kw.	11,389
S4	(intraluminal adj2 narrowing).tw,sh,kw.	30
S5	(luminal adj2 reduction).tw,sh,kw.	387
S6	(luminal adj2 narrowing).tw,sh,kw.	1822
S7	(narrowing adj2 constriction).tw,sh,kw.	16
S8	vasoconstriction*.tw,sh,kw.	39,744
S9	or/1–8	51,751
S10	Subarachnoid Hemorrhage/ or ANEURYSM, RUPTURED/ or INTRACRANIAL ANEURYSM/ or Subarachnoid Hemorrhage, Traumatic/	41,335
S11	SAH.tw,sh,kw.	9326
S12	(subarachnoid adj2 h?emorrhage).tw,sh,kw.	21,486
S13	((Intracranial or Cerebral or brain ruptur*) adj2 aneurysm*).tw,sh,kw.	15,703
S14	or/10–13	51,498
S15	(agreement or reliability or reproducibility or repeatability or variability or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or interobserver or interreader or interrater or interassessor or interviewer or interexaminer or interevaluator or interoperator or accuracy or specificity or sensitivity).tw, kw,sh.	1,715,622
S16	Observer Variation/	39,037
S17	"Reproducibility of Results"/	354,868
S18	"Sensitivity and Specificity"/	325,851
S19	Data Accuracy/ or Prospective Studies/	472,228
S20	Cerebral Angiography/ or Image Processing, Computer-Assisted/ or Ischemic Attack, Transient/dg or Tomography, X-Ray Computed/ or Ischemic Attack, Transient/et or Angiography/	516,839
S21	(angiograph* or diagnostic imaging or Tomograph*).tw,kw,sh.	792,770
S22	or/15–21	3,140,571
S23	9 and 14 and 22	3259

Step	Question	Results
Total	“Vasospasm, Intracranial”[Mesh] or intraluminal narrowing[tiab] or intraluminal narrowing[ot] or Vasospasm*[tiab] or Vasospasm[ot] or intraluminal narrowing[tiab] or intraluminal narrowing[ot] or Luminal Reduction[tiab] or Luminal Reduction[ot] or luminal Narrowing[tiab] or luminal Narrowing[ot] or narrowing constriction[tiab] or narrowing constriction[ot] or vasoconstriction[tiab] or vasoconstriction[ot] AND “Subarachnoid Hemorrhage”[Mesh] OR SAH[tiab] or SAH[ot] OR Subarachnoid hemorrhage[tiab] OR Subarachnoid hemorrhage[ot] or subarachnoid hemorrhage[tiab] or subarachnoid hemorrhage[ot] OR “Subarachnoid Hemorrhage, Traumatic”[Mesh] OR “Intracranial Aneurysm”[Mesh] OR Intracranial Aneurysm*[tiab] OR Intracranial Aneurysm*[ot] or Berry Aneurysm[tiab] or Berry Aneurysm[ot] or Brain Aneurysm*[tiab] OR Brain Aneurysm*[ot] OR Cerebral Aneurysm*[tiab] OR Cerebral Aneurysm*[ot] OR “Aneurysm, Ruptured”[Mesh] OR aneurysmal rupture[tiab] OR aneurysmal rupture[ot] OR ruptured aneurysm[ot] OR ruptured aneurysm[tiab] AND agreement[ot] or reliability[ot] or reproducibility[ot] or repeatability[ot] or variability[ot] or interobserver[ot] or interreader[ot] or interrater[ot] or interassessor[ot] or interviewer[ot] or interexaminer[ot] or interevaluator [ot] or interoperator[ot] or interobserver[ot] or interreader[ot] or interrater[ot] or interassessor[ot] or interreviewer[ot] or interexaminer[ot] or interevaluator[ot] or interoperator[ot] or accuracy[ot] or specificity[ot] or sensitivity[ot] or agreement[ot] or reliability[ot] or reproducibility[ot] or repeatability[ot] or variability[ot] or interobserver[ot] or interreader[ot] or interrater[ot] or interassessor[ot] or interreviewer[ot] or interexaminer[ot] or interevaluator[ot] or interoperator[ot] or interobserver[ot] or interreader[ot] or interrater[ot] or interassessor [ot] or interreviewer[ot] or interexaminer[ot] or interevaluator[ot] or interoperator[ot] or accuracy[ot] or specificity[ot] or sensitivity[ot] or agreement [tiab] or reliability[tiab] or reproducibility[tiab] or repeatability[tiab] or variability[tiab] or interobserver[tiab] or interreader[tiab] or interrater[tiab] or interassessor[tiab] or interreviewer[tiab] or interexaminer[tiab] or interevaluator[tiab] or interoperator[tiab] or interobserver[tiab] or interreader[tiab] or interrater[tiab] or interassessor[tiab] or interreviewer[tiab] or interexaminer[tiab] or interevaluator[tiab] or interoperator[tiab] or accuracy[tiab] or specificity[tiab] or sensitivity[tiab] or agreement [tiab] or reliability[tiab] or reproducibility[tiab] or repeatability[tiab] or variability[tiab] or interobserver[tiab] or interreader[tiab] or interrater[tiab] or interassessor[tiab] or interreviewer[tiab] or interexaminer[tiab] or interevaluator[tiab] or interoperator[tiab] or accuracy[tiab] or specificity[tiab] or sensitivity[tiab] or “Observer Variation”[Mesh] OR “Reproducibility of Results”[Mesh] OR “Sensitivity and Specificity”[Mesh] OR “Data Accuracy”[Mesh] OR Negative Predictive Value*[tiab] OR Negative Predictive Value*[ot] OR NPV[tiab] OR NPV[ot] OR Positive Predictive Value*[tiab] OR Positive Predictive Value*[ot] OR PPV[tiab] OR PPV[ot] OR “Prospective Studies”[Mesh] OR “Cerebral Angiography”[Mesh] OR “Image Processing, Computer-Assisted”[Mesh] OR “Ischemic Attack, Transient/ diagnostic imaging”[Mesh] OR “Tomography, X-Ray Computed”[Mesh] OR “Ischemic Attack, Transient/ etiology”[Mesh] OR “Angiography”[Mesh] OR angiograph*[tiab] OR angiograph*[ot] OR diagnostic imaging[tiab] OR diagnostic imaging[ot] OR Tomograph*[tiab] OR Tomograph*[ot] angiograph* OR diagnostic imaging OR Tomograph*	3370

Study	Visual Grading Scale Cutoffs	Grade	Method	Technique
Schneck-Kricheff, 1964 ³⁶	Mild <30%, moderate 30%–60%, marked ≥60%	3	Visual estimate	DSA
Kassell, 1992 ³⁷	None, mild <50%, moderate 50%, severe >50%	4	Visual estimate	DSA
Takagi, 1998 ²²	None, mild <50%, moderate 50%–75%, severe >75%	4	Visual estimate	DSA
Anderson, 2000 ^{38a}	None, mild <30%, moderate 30%–50%, severe >50%	4	Caliper	DSA
Otawara, 2002 ³⁹	None, mild 0%–30%, moderate 31%–60%, marked >60%	4	Visual estimate	DSA
Yoon, 2006 ^{40a}	No spasm, mild <25%, moderate 25%–50%, severe 51%–99%, total occlusion	5	Caliper	DSA
Joo, 2006 ⁴¹	None, mild <30%, moderate 30%–< 60%, severe ≥60%	4	Visual estimate	DSA
Binaghi et al, 2007 ^{8a,b}	None, mild <50%, moderate 50%–75%, severe >75%	4	Visual estimate	DSA, CTA
Chaudhary et al, 2008 ^{6a,b}	None, mild <30%, moderate 30%–50%, severe 51–99%, complete occlusion	5	Caliper	DSA, CTA
Aralasmak, 2009 ⁴²	Negative, mild <25%, moderate 25%–50%, severe ≥50%	4	Visual estimate	CTA
Shankar et al, 2012 ^{7a,b}	Mild <30%, moderate ≥30%–< 60%, severe ≥60%	3	Visual estimate	DSA, CTA
Zhang, 2013 ⁴³	None, mild <25%, moderate 25%–50%, severe ≥50%	4	Visual estimate	DSA, CTA
Danura, 2015 ⁴⁴	Mild 10–30%, moderate 30%–50%, severe ≥50%	3	Visual estimate	DSA
Stecco, 2018 ^{45a}	Slight <50%, moderate 50 < 75%, severe >75%	3	Visual estimate	DSA, CTA

^b Agreement (interobserver) study.

On-line Table 7: CTA studies including inter reader reliability for cerebral vasospasm

Studies	Patients	Segments	Raters	Evaluation Levels	Methods	Reference to Initial CTA	Scale Cutoffs	Grades	Interobserver (κ)
Shankar et al, 2012 ⁷	34	17	2	Patients Patients	Eyeballing	Yes	Vasospasm: yes/no, central Vasospasm: yes/no, peripheral 0, <30, 30–60, >60%	2 2 4	0.79 0.66 Range, 0.40–0.72
Binaghi et al, 2007 ⁸	22	13	3	Segments Segments	Eyeballing	Yes	Vasospasm: yes/no 0, 1–75, >75%	2 3	0.79 0.76
Chaudhary et al, 2008 ⁶	33	19	2	Segments Segments	Caliper	No	0, <30, 30–50, 51–99, 100% 0, <30, 30–50, 51–99, 100%	5 5	0.712 (weighted) (range, 0.678–0.780) 0.5 (nonweighted)

On-line Table 8: Interreader agreement for the 3 main questions

Readers	Questions, κ (95% CI)		
	Vasospasm $\geq$ 50%	Medical Treatment	DSA $\pm$ Angioplasty
All	0.340 (0.232–0.462)	0.245 (0.179–0.336)	0.272 (0.159–0.415)
Juniors	0.271 (0.173–0.401)	0.066 (–0.001–0.150)	0.221 (0.118–0.357)
Seniors	0.433 (0.266–0.582)	0.360 (0.248–0.493)	0.435 (0.273–0.714)
Interventional neuroradiologists	0.550 (0.325–0.755)	0.200 (0.026–0.387)	0.504 (0.291–0.752)
Diagnostic neuroradiologists	0.408 (0.224–0.595)	0.386 (0.215–0.573)	0.308 (0.053–0.616)

On-line Table 9: Dichotomous answer proportions among readers stratified by experience and specialty

Readers	Moderate-to-Severe Vasospasm		Medical Treatment	<i>P</i>	DSA $\pm$ Angioplasty	
		<i>P</i>				<i>P</i>
Seniors	36%	<.001 ^a	49%	<.001 ^a	15%	<.001 ^a
Juniors	56%		72%		44%	
Interventional neuroradiologists	14%	<.001 ^a	32%	.277	9%	.757
Diagnostic neuroradiologists	30%		29%		10%	

^a Indicates statistically significant proportion difference ($p < .05$).

On-line Table 10: Intrareader agreement for the 3 main questions

Readers	Questions, κ (95% CI)		
	Vasospasm $\geq$ 50%	Medical Treatment	DSA $\pm$ Angioplasty
Reader 1	0.632 ^a (0.401–0.863)	0.653 ^a (0.447–0.860)	0.781 ^a (0.578–0.985)
Reader 2	0.644 ^a (0.421–0.868)	0.622 ^a (0.389–0.855)	0.610 ^a (0.356–0.864)
Reader 3	0.668 ^a (0.365–0.970)	0.554 (0.237–0.871)	0.494 (0.118–0.870)
Reader 4	0.473 (0.237–0.709)	0.609 ^a (0.384–0.833)	0.522 (0.252–0.792)

^a Reliability coefficient equal or higher than substantial agreement ($\kappa > 0.6$).

On-line Table 11: Inter- and intrareader kappa coefficients for proximal arterial segments

		Unweighted κ Coefficients (95% CI)	κ Coefficients (95% CI)
		None to Severe (4 grades)	< 50 % vs $\geq$ 50 % Narrowing
Right ICA			
Inter-reader			
All		0.189 (0.109–0.273)	0.211 (0.078–0.307)
Junior		0.130 (0.036–0.238)	0.232 (0.078–0.408)
Senior		0.235 (0.144–0.341)	0.132 (0.021–0.303)
INR		0.325 (0.195–0.582)	0.172 (–0.030–0.493)
DNR		0.187 (0.020–0.330)	0.101 (–0.042–0.409)
Intra-reader			
Obs 1		0.503 (0.281–0.706)	0.634 (0.253–1.000)
Obs 2		0.269 (–0.003–0.578)	0.380 (–0.153–0.914)
Obs 3		0.091 (–0.267–0.449)	0
Obs 4		0.751 (0.520–0.981)	NA
Left ICA			
Inter-reader			
All		0.165 (0.088–0.250)	0.091 (0.018–0.178)
Junior		0.112 (0.030–0.231)	0.101 (–0.060–0.239)
Senior		0.145 (0.067–0.254)	0.048 (–0.020–0.131)
INR		0.201 (0.069–0.333)	0.306 (–0.020–0.486)
DNR		0.146 (0.007–0.304)	–0.027 (–0.049–0.007)
Intra-reader			
Obs 1		0.326 (0.042–0.565)	0.645 (0.189–1.000)
Obs 2		0.709 (0.402–0.936)	0.658 (0.033–1.000)
Obs 3		0.213 (–0.047–0.576)	0.479 (–0.138–1.000)
Obs 4		0.484 (0.186–0.746)	0
Right A1			
Inter-reader			
All		0.255 (0.177–0.344)	0.355 (0.222–0.499)
Junior		0.236 (0.158–0.367)	0.343 (0.214–0.527)
Senior		0.253 (0.167–0.364)	0.337 (0.168–0.547)
INR		0.222 (0.100–0.347)	0.369 (0.053–0.711)
DNR		0.338 (0.203–0.478)	0.381 (0.194–0.576)
Intra-reader			
Obs 1		0.369 (0.157–0.575)	0.535 (0.253–0.817)
Obs 2		0.588 (0.322–0.801)	1
Obs 3		0.220 (–0.038–0.488)	0.479 (–0.138–1.000)
Obs 4		0.295 (0.064–0.520)	0.494 (0.118–0.870)
Left A1			
Inter-reader			
All		0.225 (0.154–0.320)	0.305 (0.162–0.478)
Junior		0.198 (0.111–0.326)	0.295 (0.153–0.488)
Senior		0.221 (0.142–0.327)	0.310 (0.146–0.555)
INR		0.209 (0.097–0.364)	0.440 (0.075–0.767)
DNR		0.237 (0.121–0.374)	0.307 (0.086–0.540)
Intra-reader			
Obs 1		0.345 (0.131–0.576)	0.545 (0.248–0.843)
Obs 2		0.761 (0.541–0.920)	1
Obs 3		0.324 (0.080–0.604)	0.648 (0.200–1.000)
Obs 4		0.557 (0.331–0.763)	0.779 (0.486–1.000)
Right M1			
Inter-reader			
All		0.280 (0.212–0.359)	0.475 (0.317–0.602)
Junior		0.197 (0.126–0.286)	0.393 (0.260–0.547)
Senior		0.393 (0.294–0.487)	0.636 (0.449–0.728)
INR		0.388 (0.234–0.572)	0.495 (0.290–0.870)
DNR		0.451 (0.299–0.598)	0.802 (0.527–0.957)
Intra-reader			
Obs 1		0.537 (0.344–0.739)	0.559 (0.252–0.865)
Obs 2		0.489 (0.252–0.689)	0.766 (0.517–1.000)
Obs 3		0.173 (–0.030–0.409)	0.310 (–0.159–0.780)
Obs 4		0.555 (0.345–0.787)	0.485 (–0.115–1.000)

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On-line Table 11: Continued

		Unweighted κ Coefficients (95% CI)	κ Coefficients (95% CI)
		None to Severe (4 grades)	<50 % vs $\geq$ 50 % Narrowing
Left M1			
Inter-reader			
All	0.329 (0.249–0.399)	0.571 (0.383–0.733)	
Junior	0.278 (0.186–0.385)	0.507 (0.336–0.702)	
Senior	0.399 (0.294–0.479)	0.625 (0.404–0.784)	
INR	0.450 (0.301–0.604)	0.668 (0.369–0.901)	
DNR	0.477 (0.273–0.633)	0.581 (0.277–0.808)	
Intra-reader			
Obs 1	0.624 (0.416–0.795)	0.669 (0.369–0.968)	
Obs 2	0.524 (0.298–0.726)	0.852 (0.652–1.000) ^a	
Obs 3	0.413 (0.192–0.643)	0.558 (0.174–0.941)	
Obs 4	0.406 (0.169–0.597)	0.694 (0.369–1.000)	
Right P1			
Inter-reader			
All	0.218 (0.152–0.297)	0.329 (0.154–0.504)	
Junior	0.173 (0.097–0.276)	0.335 (0.134–0.578)	
Senior	0.210 (0.107–0.311)	0.244 (0.096–0.458)	
INR	0.188 (0.027–0.383)	0.054 (–0.070–0.305)	
DNR	0.221 (0.087–0.372)	0.332 (0.074–0.581)	
Intra-reader			
Obs 1	0.554 (0.361–0.742)	0.242 (–0.200–0.685)	
Obs 2	0.495 (0.259–0.740)	0.370 (–0.188–0.928)	
Obs 3	0.160 (–0.075–0.468)	–0.020 (–0.069–0.028)	
Obs 4	0.303 (0.077–0.566)	0.485 (–0.115–1.000)	
Left P1			
Inter-reader			
All	0.247 (0.159–0.334)	0.418 (0.190–0.563)	
Junior	0.210 (0.107–0.315)	0.452 (0.194–0.680)	
Senior	0.266 (0.163–0.406)	0.350 (0.195–0.496)	
INR	0.321 (0.146–0.455)	0.340 (–0.040–0.847)	
DNR	0.193 (0.016–0.392)	0.481 (0.076–0.793)	
Intra-reader			
Obs 1	0.392 (0.154–0.622)	–0.033 (–0.098–0.032)	
Obs 2	0.572 (0.320–0.813)	0.370 (–0.188–0.928)	
Obs 3	0.322 (0.017–0.626)	0.479 (–0.138–1.000)	
Obs 4	0.361 (0.108–0.608)	0.790 (0.391–1.000)	
Basilar artery			
Inter-reader			
All	0.369 (0.252–0.470)	0.506 (0.323–0.603)	
Junior	0.297 (0.193–0.425)	0.502 (0.326–0.651)	
Senior	0.442 (0.282–0.625)	0.527 (0.183–0.589)	
INR	0.336 (0.153–0.513)	0.251 (–0.030–0.486)	
DNR	0.567 (0.272–0.797)	0.706 (0.320–1.000)	
Intra-reader			
Obs 1	0.483 (0.205–0.761)	0.645 (0.189–1.000)	
Obs 2	0.796 (0.608–0.953) ^a	0.847 (0.553–1.000)	
Obs 3	0.424 (0.122–0.699)	–0.020 (–0.069–0.028)	
Obs 4	0.513 (0.250–0.765)	0	
Right VA			
Inter-reader			
All	0.257 (0.128–0.387)	0.173 (0.011–0.302)	
Junior	0.178 (0.032–0.370)	0.144 (–0.020–0.408)	
Senior	0.303 (0.192–0.452)	0.210 (–0.001–0.393)	
INR	0.374 (0.072–0.781)	–0.007 (–0.030–0.006)	
DNR	0.235 (0.032–0.465)	0.306 (–0.020–0.493)	
Intra-reader			
Obs 1	0.336 (–0.071–0.743)	NA	
Obs 2	0.623 (0.260–0.900)	1	
Obs 3	0.790 (0.391–1.000)	NA	
Obs 4	0.434 (0.059–0.809)	NA	

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On-line Table 11: Continued

	Unweighted κ Coefficients (95% CI)	κ Coefficients (95% CI)
	None to Severe (4 grades)	< 50 % vs $\geq$ 50 % Narrowing
Left VA		
Inter-reader		
All	0.307 (0.179–0.417)	0.338 (0.090–0.554)
Junior	0.217 (0.091–0.407)	0.362 (0.070–0.590)
Senior	0.441 (0.260–0.653)	0.297 (0.064–0.589)
INR	0.439 (0.221–0.709)	0.493 (0.464–0.493)
DNR	0.426 (0.211–0.608)	0.340 (–0.007–0.486)
Intra-reader		
Obs 1	0.565 (0.000–0.913)	1
Obs 2	0.521 (0.174–0.867)	0
Obs 3	0.335 (–0.020–0.490)	–0.027 (–0.084–0.030)
Obs 4	0.308 (–0.017–0.703)	1

Note:—DNR indicates diagnostic neuroradiology; Obs, observer; INR, interventional neuroradiology; NA, not applicable; VA, vertebral artery. The absence of confidence intervals in some cells is explained by too few ratings to conduct this calculation.

NA indicates that all ratings were 0 after dichotomisation (no-mild vasospasm) without any case in the moderate-severe category, precluding kappa analysis.

^a Values statistically significantly higher than substantial agreement ($\kappa > 0.6$ reliability coefficient).

On-line Table 12: Inter- and intrareader kappa coefficients for distal arterial segments

	Unweighted κ Coefficients (95% CI)	κ Coefficients (95% CI)
	None to Severe (4 grades)	< 50 % vs $\geq$ 50 % Narrowing
Right A2-A3		
Inter-reader		
All	0.230 (0.165–0.308)	0.309 (0.179–0.475)
Junior	0.183 (0.105–0.268)	0.253 (0.126–0.439)
Senior	0.262 (0.182–0.354)	0.368 (0.200–0.628)
INR	0.152 (0.031–0.274)	0.280 (–0.010–0.593)
DNR	0.334 (0.196–0.495)	0.378 (0.168–0.593)
Intra-reader		
Obs 1	0.493 (0.320–0.687)	0.561 (0.292–0.831)
Obs 2	0.507 (0.302–0.722)	0.735 (0.451–1.000)
Obs 3	0.267 (0.037–0.508)	0.790 (0.391–1.000)
Obs 4	0.468 (0.264–0.665)	0.384 (0.080–0.687)
Left A2-A3		
Inter-reader		
All	0.218 (0.149–0.306)	0.303 (0.177–0.462)
Junior	0.144 (0.068–0.239)	0.210 (0.098–0.376)
Senior	0.255 (0.169–0.354)	0.395 (0.201–0.635)
INR	0.190 (0.074–0.317)	0.336 (0.065–0.628)
DNR	0.279 (0.143–0.447)	0.471 (0.268–0.702)
Intra-reader		
Obs 1	0.485 (0.308–0.669)	0.535 (0.253–0.817)
Obs 2	0.511 (0.310–0.726)	0.668 (0.365–0.970)
Obs 3	0.233 (0.007–0.476)	0.790 (0.391–1.000)
Obs 4	0.566 (0.389–0.727)	0.464 (0.155–0.773)
Right M2-M3		
Inter-reader		
All	0.153 (0.081–0.237)	0.222 (0.108–0.336)
Junior	0.118 (0.032–0.23)	0.227 (0.089–0.397)
Senior	0.158 (0.078–0.250)	0.186 (0.078–0.290)
INR	0.089 (–0.020–0.226)	–0.0417 (–0.090–0.020)
DNR	0.179 (0.032–0.358)	0.291 (0.133–0.414)
Intra-reader		
Obs 1	0.221 (0.019–0.461)	0.459 (0.017–0.902)
Obs 2	0.408 (0.162–0.651)	0.645 (0.189–1.000)
Obs 3	–0.027 (–0.139–0.084)	0
Obs 4	0.508 (0.221–0.759)	0.790 (0.391–1.000)
Left M2-M3		
Inter-reader		
All	0.205 (0.133–0.303)	0.330 (0.178–0.474)
Junior	0.203 (0.101–0.38)	0.302 (0.121–0.577)
Senior	0.210 (0.135–0.303)	0.333 (0.185–0.526)
INR	0.161 (0.031–0.339)	0.143 (–0.040–0.377)
DNR	0.302 (0.137–0.469)	0.538 (0.217–0.802)
Intra-reader		
Obs 1	0.159 (–0.051–0.380)	0.146 (–0.237–0.530)
Obs 2	0.396 (0.186–0.618)	0.459 (0.017–0.902)
Obs 3	0	0
Obs 4	0.483 (0.233–0.711)	0.847 (0.553–1.000)
Right P2-P3		
Inter-reader		
All	0.131 (0.071–0.203)	0.202 (0.086–0.316)
Junior	0.064 (–0.001–0.186)	0.149 (0.042–0.277)
Senior	0.185 (0.086–0.347)	0.294 (0.054–0.566)
INR	0.112 (–0.011–0.265)	0.132 (–0.040–0.493)
DNR	0.119 (–0.039–0.316)	0.370 (–0.027–0.721)
Intra-reader		
Obs 1	0.484 (0.099–0.813)	–0.027 (–0.084–0.030)
Obs 2	0.656 (0.413–0.882)	0.847 (0.553–1.000)
Obs 3	0	NA
Obs 4	0.227 (–0.038–0.504)	0

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On-line Table 12: Continued

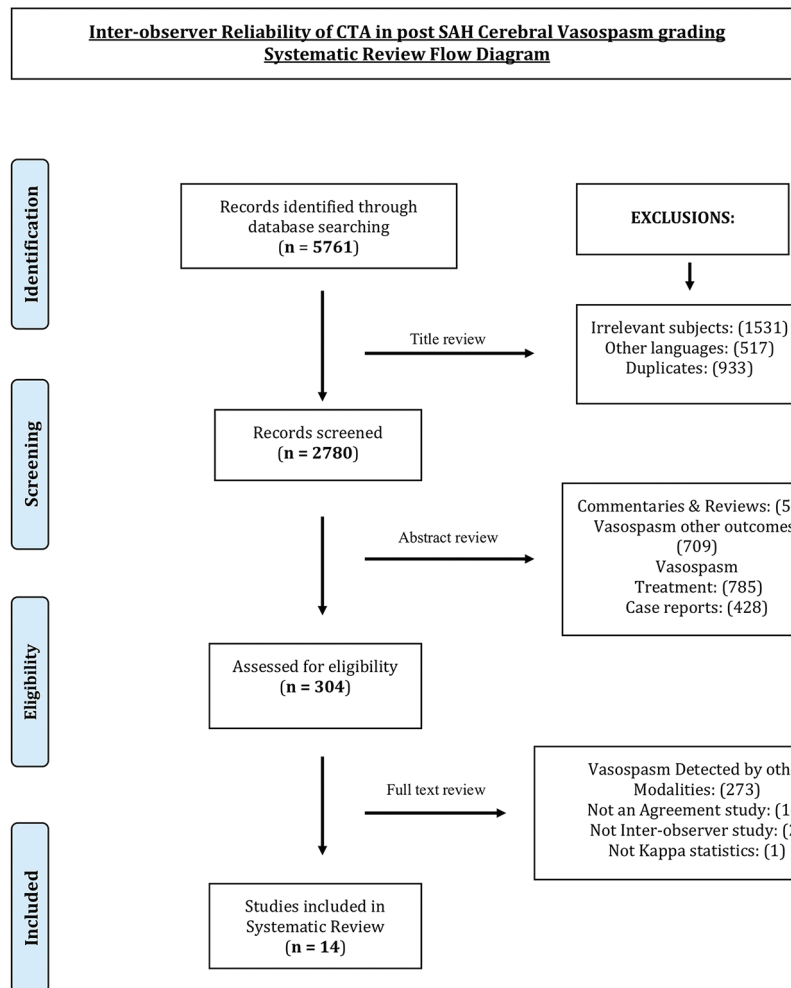
	Unweighted κ Coefficients (95% CI)	κ Coefficients (95% CI)
	None to Severe (4 grades)	< 50 % vs $\geq$ 50 % Narrowing
Left P2-P3		
Inter-reader		
All	0.106 (0.063–0.164)	0.142 (0.073–0.216)
Junior	0.033 (–0.020–0.117)	0.049 (–0.040–0.193)
Senior	0.127 (0.052–0.222)	0.239 (0.087–0.458)
INR	0.038 (–0.050–0.212)	–0.020 (–0.060–0.013)
DNR	0.146 (–0.032–0.358)	0.449 (–0.042–0.778)
Intra-reader		
Obs 1	0.400 (–0.049–0.813)	–0.020 (–0.069–0.028)
Obs 2	0.583 (0.291–0.819)	1
Obs 3	0	NA
Obs 4	0.369 (0.076–0.659)	0

Note:—DNR indicates Diagnostic Neuroradiology; Obs, observer; INR, Interventional Neuroradiology; NA, not applicable; VA, vertebral artery. The absence of confidence intervals in some cells is explained by too few ratings to conduct this calculation.

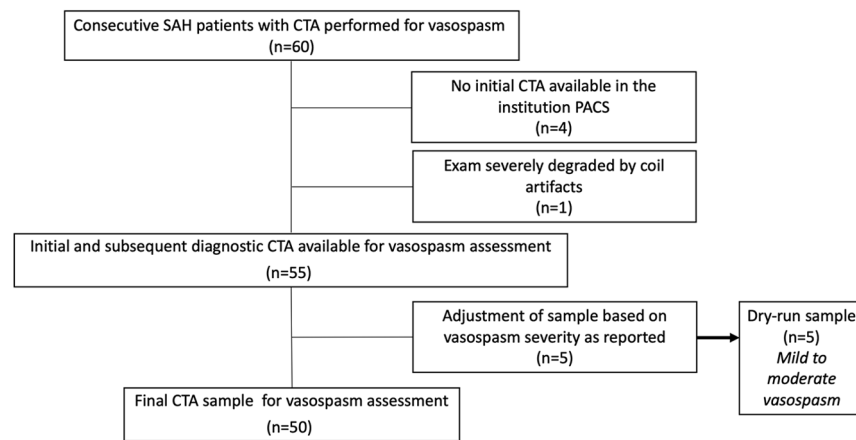
NA indicates that all ratings were 0 after dichotomisation (no-mild vasospasm) without any case in the moderate-severe category, precluding kappa analysis.

On-line Table 13: Interobserver reliability coefficients for all observers after removal of segments obscured by metal artifacts

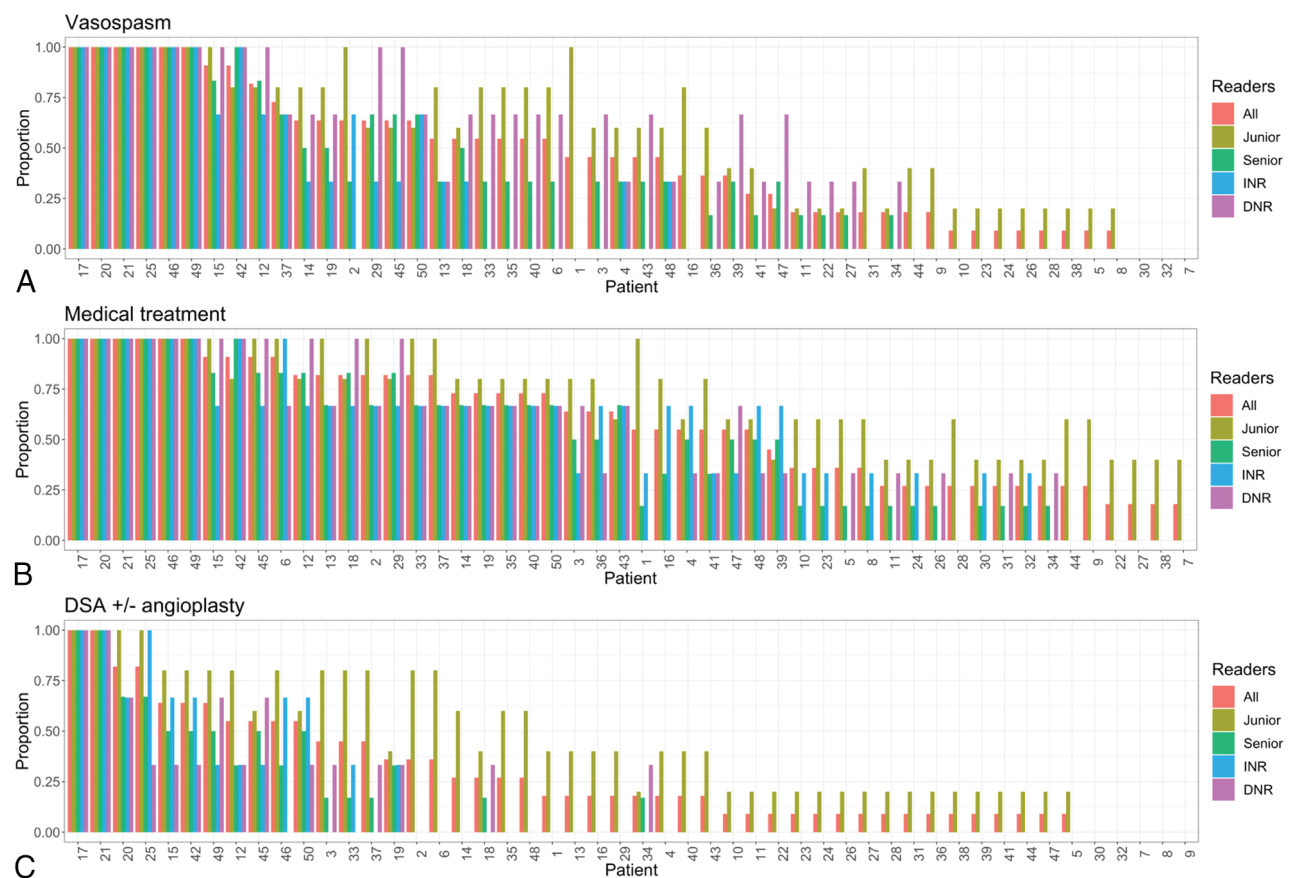
	κ Coefficients	95% Confidence Intervals	κ Coefficients	95% Confidence Intervals
	None to Severe (4 Grades)		< 50% vs $\geq$ 50% Narrowing	
All Observers				
Right A2–A3	0.262	(0.199–0.358)	0.365	(0.209–0.636)
Left A2–A3	0.248	(0.178–0.336)	0.358	(0.221–0.574)
Right A1	0.307	(0.218–0.465)	0.432	(0.279–0.668)
Left A1	0.260	(0.173–0.385)	0.382	(0.224–0.600)
Right M1	0.304	(0.233–0.381)	0.515	(0.362–0.647)
Left M1	0.350	(0.278–0.426)	0.604	(0.453–0.779)
Right ICA	0.210	(0.126–0.298)	0.224	(0.104–0.336)
Left ICA	0.176	(0.110–0.284)	0.100	(0.034–0.218)
Senior observers				
Right A2–A3	0.302	(0.214–0.405)	0.217	(0.216–0.684)
Left A2–A3	0.296	(0.202–0.397)	0.267	(0.267–0.701)
Right A1	0.323	(0.204–0.450)	0.232	(0.232–0.688)
Left A1	0.261	(0.167–0.406)	0.172	(0.172–0.641)
Right M1	0.419	(0.322–0.508)	0.544	(0.544–0.744)
Left M1	0.423	(0.322–0.513)	0.424	(0.424–0.819)
Right ICA	0.266	(0.182–0.382)	0.020	(0.020–0.303)
Left ICA	0.152	(0.070–0.269)	0.010	(0.010–0.306)



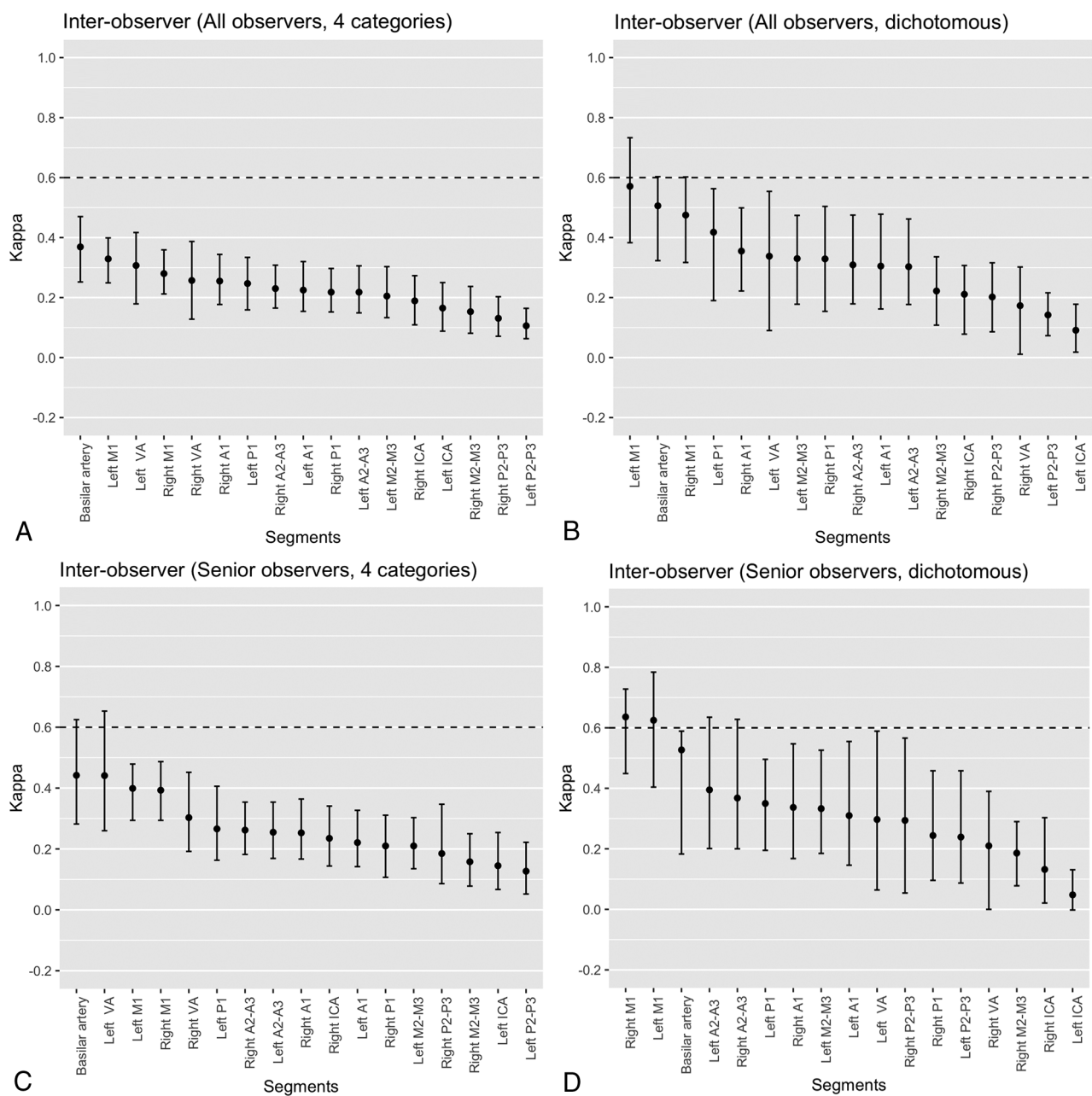
ON-LINE FIG 1. Flow diagram demonstrating the systematic review selection process.



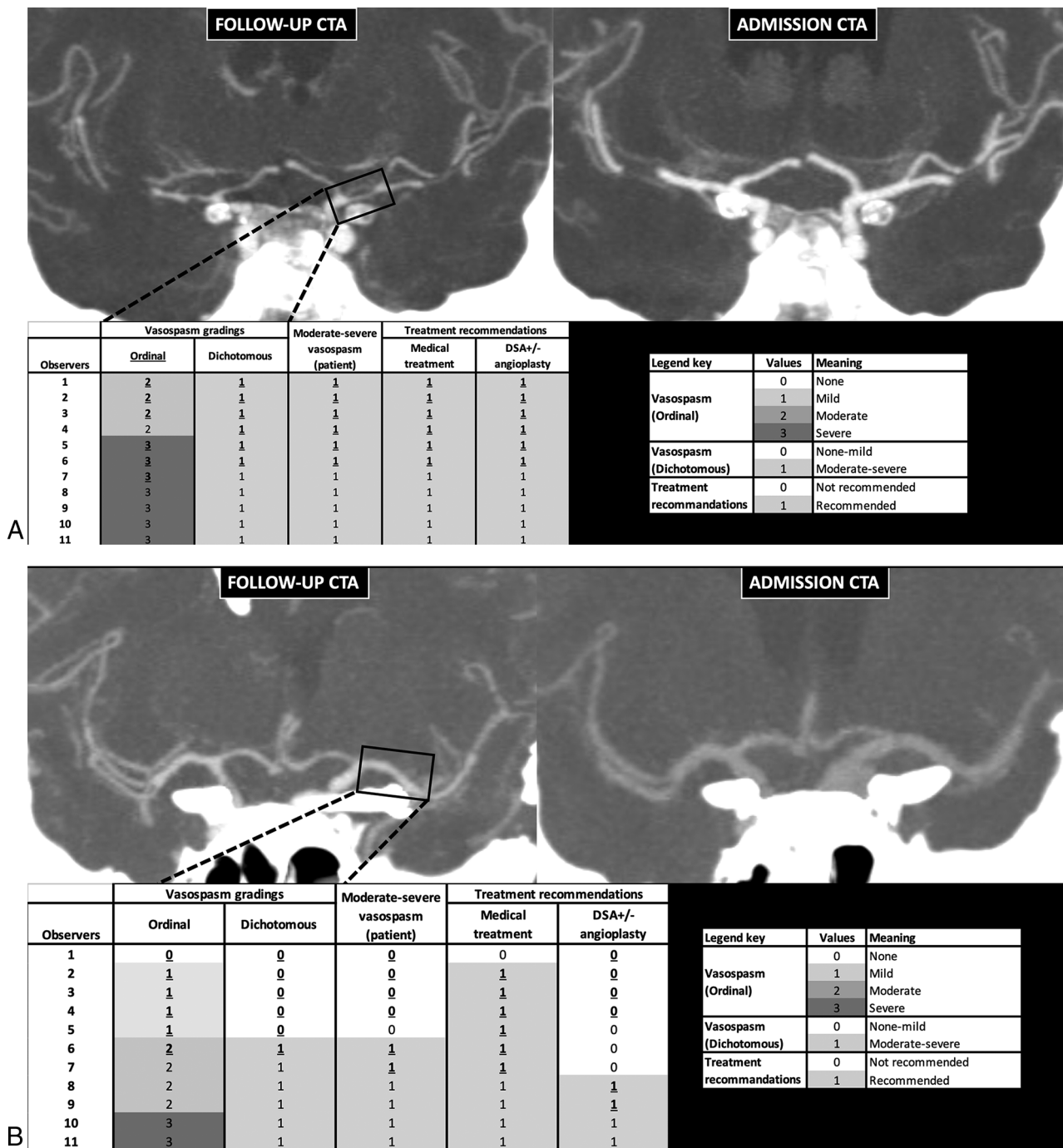
ON-LINE FIG 2. Flow diagram demonstrating the patients' selection process to obtain the final 50 CTAs to be used in the intra- and interrater reliability study.



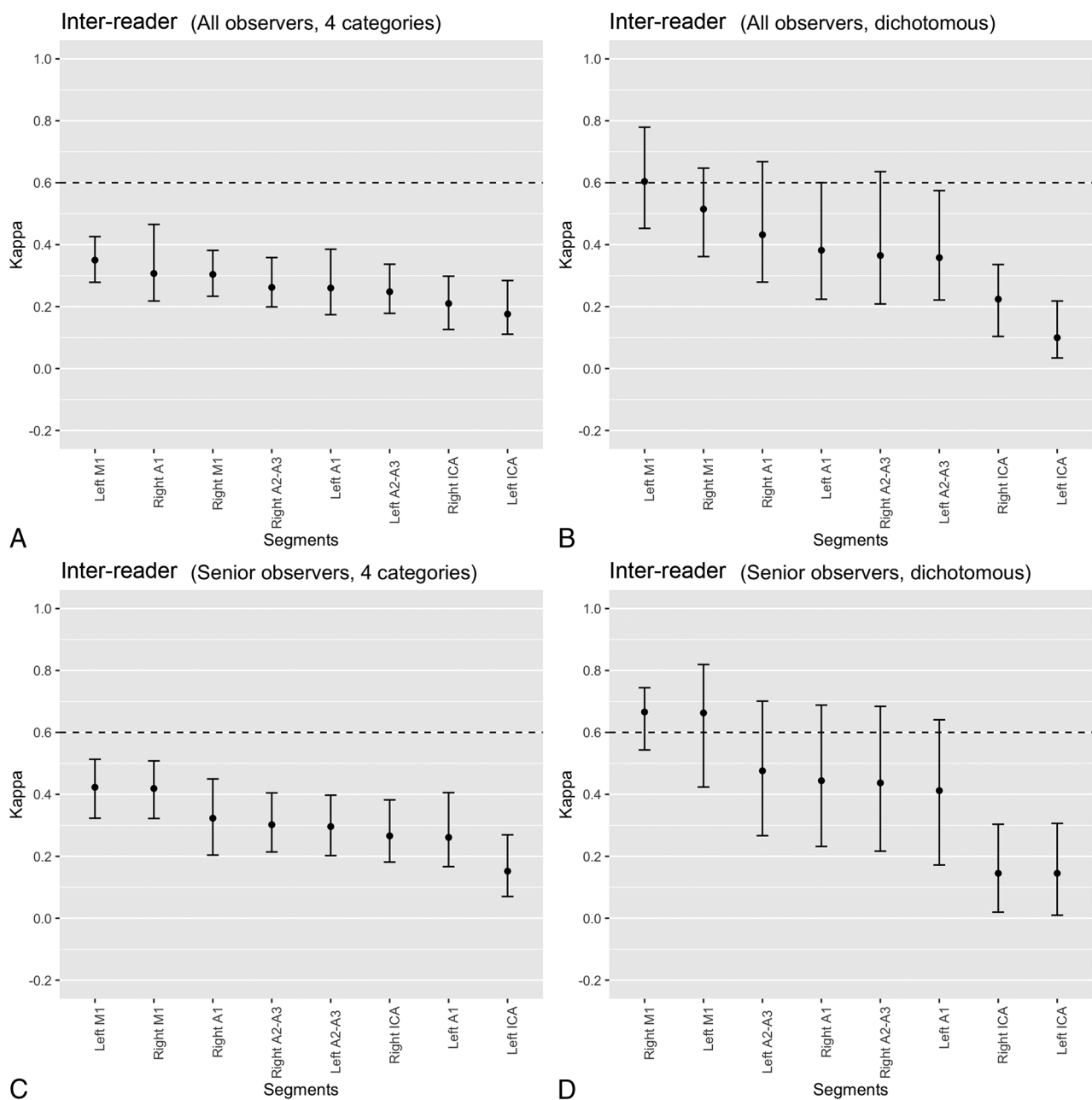
ON-LINE FIG 3. Proportions of answers for each category of readers for the 3 main questions: 1) detection of moderate-severe vasospasm in any arterial segment ($\geq 50\%$ narrowing), 2) recommendations of medical treatment augmentation, and 3) DSA $\pm$ angioplasty based on imaging findings. The patients are ordered in decreasing frequency of answers. INR indicates interventional neuroradiology; DNR, diagnostic neuroradiology.



ON-LINE FIG 4. Interreader reliability coefficients (95% confidence intervals) for all observers for the 17 arterial segments on the 4-point scale (A) or dichotomized into none-mild versus moderate-severe (< or ≥50% narrowing) (B). The same coefficients are illustrated for senior observers in C and D. The horizontal *dashed line* indicates the threshold for substantial agreement ($\kappa > 0.6$). Segments were ordered by decreasing κ values. VA indicates vertebral artery.



ON-LINE FIG 5. A, Examples of maximal agreement and disagreement for the left M1 segment vasospasm gradings. Coronal MIPs post- (left) and pre- (right) endovascular treatment of a left vertebral dissecting aneurysm (not shown) in a 48-year-old man with a Hunt and Hess grade 4 and modified Fisher grade 4 SAH. The follow-up CTA was performed 7 days postadmission because of an altered level of consciousness. Note the diffuse multifocal vasospasm involving several arterial segments depicted on this image. B, Example of maximal disagreement. Coronal MIPs post- (left) and pre- (right) left carotid ophthalmic aneurysm clipping in a 40-year-old woman with a Hunt and Hess grade 3 and modified Fisher grade 4 aneurysmal SAH. The follow-up CTA was performed 6 days postadmission because of an altered level of consciousness. The tables show the ratings obtained by the 11 observers for the vasospasm gradings of the left M1 segment (both on the 4-point ordinal scale and when dichotomized) and ratings for the presence of moderate-to-severe vasospasm as well as treatment recommendations based on imaging findings for this patient. Senior readers are in **bolded and underlined**. Of note, the readers' numbers do not match the same observer for each column but were rather ordered to show increasing values for each rating.



ON-LINE FIG 6. Interreader reliability coefficients (95% confidence intervals) for all observers for the 4 bilateral arterial segments most frequently obscured by metal artifacts (after removal of individual segments masked by metal artifacts) using a 4-point scale (A) or dichotomized into none-mild versus moderate-severe ($<$ or $\geq 50\%$ narrowing) (B). The same coefficients are illustrated for senior observers in C and D. The horizontal dashed line indicates the threshold for substantial agreement ($\kappa > 0.6$).