

## **Supplemental Materials**

### Supplemental Methods 1. Six subgroups of aneurysm location

1) Extra-dural ring; cavernous internal carotid artery (ICA). 2) Around-dural ring; paraclinoid and ophthalmic ICA. 3) Intracranial distal ICA; P-com, anterior choroidal artery, distal ICA, ICA bifurcation. 4) Middle cerebral artery (MCA) major branch; MCA, MCA bifurcation, and M2. 5) Anterior cerebral artery (ACA) major branch; A-com, A1, and A2. 6) Posterior circulation: basilar tip and basilar artery (BA)- superior cerebellar artery (SCA) aneurysms

**Table S1. Diagnostic performance of CAD software and reader-average, with statistical comparison**

	<b>CAD software</b>	<b>Human without CAD assistance</b>	<b>Human with CAD assistance</b>	<b>CAD vs. Human (without CAD assistance)</b>	<b>CAD vs. Human (with CAD assistance)</b>	<b>Human (without) vs. Human (with CAD assistance)</b>
Sensitivity % (95% CI)	74.8 (67.5, 82.1)	73.5 (69.8, 77.2)	86.5 (83.6, 89.4)	0.757	<b>0.004</b>	<b>&lt;0.001</b>
Specificity % (95% CI)	93.9 (90.6, 97.2)	94.8 (93.2, 96.3)	95.2 (93.7, 96.7)	0.636	0.497	0.729
Sensitivity per lesion % (95% CI)	92.3 (88.1, 96.5)	78.4 (74.3, 82.5)	95 (92.8, 97.1)	<b>&lt;0.001</b>	0.095	<b>&lt;0.001</b>
False positive per case	0.12 (0.086, 0.169)	0.045 (0.035, 0.059)	0.064 (0.049, 0.084)	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>0.017</b>

CAD: computer-assisted detection

**Table S2. Sensitivity per lesion of subgroups, with comparison between each occasion\***

<b>Subgroup</b>	<b>CAD software</b>	<b>Human without CAD assistance</b>	<b>Human with CAD assistance</b>	<b>CAD vs. Human (without CAD assistance)</b>	<b>CAD vs. Human (with CAD assistance)</b>	<b>Human (without) vs. Human (with CAD assistance)</b>
<b>Diameter</b> % (95% CI)**						
<3 mm	84 (75.6, 92.3)	68.8 (62.2, 75.4)	91.4 (87.3, 95.4)	<b>&lt;0.001</b>	<b>0.018</b>	<b>&lt;0.001</b>
3-5 mm	100 (100, 100)	86.2 (82, 90.4)	98.4 (96.7, 100)	<b>&lt;0.001</b>	<b>0.050</b>	<b>&lt;0.001</b>
>5 mm	100 (100, 100)	93.8 (87.6, 99.9)	97.9 (94, 101.8)	<b>0.046</b>	0.296	0.296
<b>Volume</b> % (95% CI)**						
<10 cc	77.6 (66.4, 88.8)	65.5 (58, 73)	88.8 (83.7, 93.9)	<b>0.014</b>	<b>0.005</b>	<b>&lt;0.001</b>
10-20 cc	100 (100, 100)	80.3 (74, 86.5)	97.6 (95, 100)	<b>&lt;0.001</b>	0.073	<b>&lt;0.001</b>
> 20cc	100 (100, 100)	89.4 (85.1, 93.7)	98.7 (97.4, 100)	<b>&lt;0.001</b>	0.067	<b>&lt;0.001</b>
<b>Location</b> % (95% CI)**						
ACA major branch	60 (29.9, 90.1)	35 (8.7, 61.3)	70 (44.4, 95.6)	0.151	0.120	0.054
Around-dural ring	93.4 (88.7, 98.1)	82.5 (78.5, 86.6)	96.9 (94.9, 99)	<b>&lt;0.001</b>	<b>0.035</b>	<b>&lt;0.001</b>
Extra-dural ring	83.3 (62.2, 100)	75 (60.9, 89.1)	93.8 (85.3, 100)	0.401	0.130	<b>0.005</b>
Intracranial Distal ICA	100 (100, 100)	70.7 (60.1, 81.2)	92.4 (86.9, 97.9)	<b>&lt;0.001</b>	<b>0.007</b>	<b>&lt;0.001</b>
MCA major branch	94.7 (84.7, 100)	78.9 (65.3, 92.6)	96.1 (90.7, 100)	<b>0.017</b>	0.828	<b>0.006</b>
Posterior circulation	75 (32.6, 100)	75 (57.7, 92.3)	87.5 (57.7, 92.3) (66.3, 100)	>.999	0.248	<b>0.046</b>

CAD, computer-assisted detection; ACA, anterior cerebral artery; ICA, internal carotid artery; MCA, middle cerebral artery

\*P-value for interaction between diameter, volume, and location subgroups and occasion (CAD, human (with), human (without)) were <0.0001, <0.0001, and 0.0325, respectively.

\*\*95% CI was estimated by logistic regression with GEE.

**Table S3. Reader-individual comparisons in each subgroup**

Subgroup	Reader	Before	After	Before	After	Before vs. After	P-value
<b>Diameter</b>		Sensitivity (number of detected lesions/number of total lesions)		Sensitivity (estimated 95% CI)			
<3 mm	NR	46.9 (38/81)	82.7 (67/81)	46.9 (36.3, 57.5)	82.7 (73.8, 91.6)	35.8 (23.6, 48)	<0.0001
<3 mm	NS	75.3 (61/81)	93.8 (76/81)	75.3 (65.1, 85.5)	93.8 (88.7, 98.9)	18.5 (7.4, 29.6)	0.0010
<3 mm	Radiologist	84 (68/81)	95.1 (77/81)	84 (75.3, 92.6)	95.1 (90.5, 99.6)	11.1 (2.4, 19.9)	0.0129
<3 mm	Resident	69.1 (56/81)	93.8 (76/81)	69.1 (59.1, 79.1)	93.8 (88.7, 98.9)	24.7 (15.4, 34)	<0.0001
3-5 mm	NR	68.4 (52/76)	100 (76/76)	68.4 (58.3, 78.5)	100 (NaN, NaN)	31.6 (21.5, 41.7)	<0.0001
3-5 mm	NS	89.5 (68/76)	98.7 (75/76)	89.5 (82.5, 96.5)	98.7 (96.1, 100)	9.2 (2.6, 15.8)	0.0061
3-5 mm	Radiologist	96.1 (73/76)	96.1 (73/76)	96.1 (91.7, 100)	96.1 (91.8, 100)	0 (-5.2, 5.2)	1.0000
3-5 mm	Resident	90.8 (69/76)	98.7 (75/76)	90.8 (84.4, 97.2)	98.7 (96.1, 101)	7.9 (1.9, 13.9)	0.0094
>5 mm	NR	100 (12/12)	100 (12/12)	100 (NaN, NaN)	100 (NaN, NaN)	0 (NaN, NaN)	NA
>5 mm	NS	83.3 (10/12)	100 (12/12)	83.3 (62.2, 100)	100 (NaN, NaN)	16.7 (-4.4, 37.8)	0.1213
>5 mm	Radiologist	100 (12/12)	91.7 (11/12)	100 (NaN, NaN)	91.7 (76, 100)	-8.3 (-24, 7.3)	0.2963
>5 mm	Resident	91.7 (11/12)	100 (12/12)	91.7 (76, 100)	100 (NaN, NaN)	8.3 (-7.3, 24)	0.2963
<b>Volume</b>							
<10 cc	NR	39.7 (23/58)	77.6 (45/58)	39.7 (27.7, 51.6)	77.6 (66.2, 89)	37.9 (22.9, 52.9)	<0.0001
<10 cc	NS	72.4 (42/58)	91.4 (53/58)	72.4 (60, 84.8)	91.4 (84.4, 98.3)	19 (5.4, 32.6)	0.0063
<10 cc	Radiologist	81 (47/58)	93.1 (54/58)	81 (70.2, 91.8)	93.1 (86.9, 99.3)	12.1 (1.3, 22.9)	0.0287
<10 cc	Resident	69 (40/58)	93.1 (54/58)	69 (56.9, 81.1)	93.1 (86.6, 99.6)	24.1 (12.7, 35.6)	<0.0001
10-20 cc	NR	63.5 (33/52)	98.1 (51/52)	63.5 (50.9, 76)	98.1 (94.4, 100)	34.6 (21.8, 47.4)	<0.0001
10-20 cc	NS	80.8 (42/52)	98.1 (51/52)	80.8 (70.5, 91.1)	98.1 (94.4, 100)	17.3 (7.2, 27.4)	0.0008
10-20 cc	Radiologist	94.2 (49/52)	98.1 (51/52)	94.2 (88, 100)	98.1 (94.4, 100)	3.8 (-3.6, 11.3)	0.3130
10-20 cc	Resident	82.7 (43/52)	96.2 (50/52)	82.7 (71.5, 93.9)	96.2 (91, 100)	13.5 (4.3, 22.6)	0.0038
>20 cc	NR	78 (46/59)	100 (59/59)	78 (67.5, 88.4)	100 (NaN, NaN)	22 (11.6, 32.5)	<0.0001
>20 cc	NS	93.2 (55/59)	100 (59/59)	93.2 (86.7, 99.7)	100 (NaN, NaN)	6.8 (0.3, 13.3)	0.0405
>20 cc	Radiologist	96.6 (57/59)	94.9 (56/59)	96.6 (92, 100)	94.9 (89.5, 100)	-1.7 (-7.4, 4)	0.5607
>20 cc	Resident	89.8 (53/59)	100 (59/59)	89.8 (82.4, 97.2)	100 (NaN, NaN)	10.2 (2.8, 17.6)	0.0071
<b>Location</b>							
ACA major branch	NR	20 (1/5)	60 (3/5)	20 (0, 55.1)	60 (17.1, 100)	40 (-2.9, 82.9)	0.0679
ACA major branch	NS	60 (3/5)	80 (4/5)	60 (17.1, 100)	80 (44.9, 100)	20 (-45.6, 85.6)	0.5501
ACA major branch	Radiologist	60 (3/5)	100 (5/5)	60 (17.1, 100)	100 (NaN, NaN)	40 (-2.9, 82.9)	0.0679

ACA major branch	Resident	0 (0/5)	40 (2/5)	0 (NaN, NaN)	40 (0, 82.9)	40 (-2.9, 82.9)	0.0679
Around-dural ring	NR	63.2 (67/106)	92.5 (98/106)	63.2 (54.1, 72.3)	92.5 (87.5, 97.5)	29.2 (19.9, 38.6)	<0.0001
Around-dural ring	NS	87.7 (93/106)	98.1 (104/106)	87.7 (81.2, 94.3)	98.1 (95.5, 100)	10.4 (3.6, 17.1)	0.0026
Around-dural ring	Radiologist	91.5 (97/106)	98.1 (104/106)	91.5 (86.2, 96.8)	98.1 (95.5, 100)	6.6 (1.9, 11.3)	0.0059
Around-dural ring	Resident	87.7 (93/106)	99.1 (105/106)	87.7 (81.6, 93.9)	99.1 (97.2, 100)	11.3 (5.4, 17.3)	0.0002
Extra-dural ring	NR	66.7 (8/12)	83.3 (10/12)	66.7 (40, 93.3)	83.3 (62.2, 100)	16.7 (-4.4, 37.8)	0.1213
Extra-dural ring	NS	58.3 (7/12)	91.7 (11/12)	58.3 (30.4, 86.2)	91.7 (76, 100)	33.3 (6.7, 60)	0.0143
Extra-dural ring	Radiologist	91.7 (11/12)	100 (12/12)	91.7 (76, 100)	100 (NaN, NaN)	8.3 (-7.3, 24)	0.2963
Extra-dural ring	Resident	83.3 (10/12)	100 (12/12)	83.3 (62.2, 100)	100 (NaN, NaN)	16.7 (-4.4, 37.8)	0.1213
Intracranial distal ICA	NR	47.8 (11/23)	100 (23/23)	47.8 (27.3, 68.3)	100 (NaN, NaN)	52.2 (31.7, 72.7)	<0.0001
Intracranial distal ICA	NS	78.3 (18/23)	91.3 (21/23)	78.3 (61, 95.5)	91.3 (79.7, 100)	13 (-5.4, 31.5)	0.1654
Intracranial distal ICA	Radiologist	91.3 (21/23)	82.6 (19/23)	91.3 (79.7, 100)	82.6 (67.7, 97.6)	-8.7 (-25, 7.7)	0.2973
Intracranial distal ICA	Resident	65.2 (15/23)	95.7 (22/23)	65.2 (44.9, 85.6)	95.7 (87.3, 100)	30.4 (10.9, 49.9)	0.0022
MCA major branch	NR	63.2 (12/19)	94.7 (18/19)	63.2 (40.8, 85.5)	94.7 (84.7, 100)	31.6 (10.2, 53)	0.0038
MCA major branch	NS	78.9 (15/19)	100 (19/19)	78.9 (60.4, 97.5)	100 (NaN, NaN)	21.1 (2.5, 39.6)	0.0264
MCA major branch	Radiologist	89.5 (17/19)	94.7 (18/19)	89.5 (75.6, 100)	94.7 (85.2, 100)	5.3 (-12.8, 23.3)	0.5674
MCA major branch	Resident	84.2 (16/19)	94.7 (18/19)	84.2 (67.7, 100)	94.7 (84.7, 100)	10.5 (-3.4, 24.4)	0.1373
Posterior circulation	NR	75 (3/4)	75 (3/4)	75 (32.6, 100)	75 (32.6, 100)	0 (NaN, NaN)	NA
Posterior circulation	NS	75 (3/4)	100 (4/4)	75 (32.6, 100)	100 (NaN, NaN)	25 (-17.4, 67.4)	0.2482
Posterior circulation	Radiologist	100 (4/4)	75 (3/4)	100 (NaN, NaN)	75 (32.6, 100)	-25 (-67.4, 17.4)	0.2482
Posterior circulation	Resident	50 (2/4)	100 (4/4)	50 (1, 99)	100 (NaN, NaN)	50 (1, 99)	0.0455

NR: neurologist, NS: neurosurgeon, ACA: anterior cerebral artery, ICA: internal carotid artery, MCA: middle cerebral artery

**Table S4. Detection results for every lesion of human readers and comparison with the detection result of CAD software**

<b>Group</b>	<b>Both detected (percentage)</b>	<b>Both missed (percentage)</b>	<b>AI detected but humans ignored (percentage)</b>	<b>AI missed but humans detected (percentage)</b>
<b>All (%)</b>	610/676 (90.2)	20/676 (3)	14/676 (2.1)	32/676 (4.7)
<b>Diameter</b>				
<b>&lt;3 mm</b>	264/324 (81.5)	20/324 (6.2)	8/324 (2.5)	32/324 (9.9)
<b>3-5 mm</b>	299/304 (98.4)	0/304 (0)	5/304 (1.6)	0/304 (0)
<b>&gt;5 mm</b>	47/48 (97.9)	0/48 (0)	1/48 (2.1)	0/48 (0)
<b>Volume</b>				
<b>&lt;10 cc</b>	174/232 (75)	20/232 (8.6)	6/232 (2.6)	32/232 (13.8)
<b>10-20 cc</b>	203/208 (97.6)	0/208 (0)	5/208 (2.4)	0/208 (0)
<b>&gt;20 cc</b>	233/236 (98.7)	0/236 (0)	3/236 (1.3)	0/236 (0)
<b>Location</b>				
<b>ACA major branch</b>	11/20 (55)	5/20 (25)	1/20 (5)	3/20 (15)
<b>Around-dural ring</b>	393/424 (92.7)	10/424 (2.4)	3/424 (0.7)	18/424 (4.2)
<b>Extra-dural ring</b>	40/48 (83.3)	3/48 (6.2)	0/48 (0)	5/48 (10.4)
<b>Intracranial distal ICA</b>	85/92 (92.4)	0/92 (0)	7/92 (7.6)	0/92 (0)
<b>MCA major branch</b>	69/76 (90.8)	0/76 (0)	3/76 (3.9)	4/76 (5.3)
<b>Posterior circulation</b>	12/16 (75)	2/16 (12.5)	0/16 (0)	2/16 (12.5)

ACA: anterior cerebral artery, ICA: internal carotid artery, MCA: middle cerebral artery

**Table S5. Reader-individual comparisons between CAD software for detection results of every lesion**

<b>Group</b>	<b>Reader</b>	<b>Both detected (percentage)</b>	<b>Both missed (percentage)</b>	<b>AI detected but humans ignored (percentage)</b>	<b>AI missed but humans detected (percentage)</b>
<b>All (%)</b>	<b>NR</b>	154/169 (91.1)	12/169 (7.1)	2/169 (1.2)	1/169 (0.6)
	<b>NS</b>	153/169 (90.5)	3/169 (1.8)	3/169 (1.8)	10/169 (5.9)
	<b>Radiologist</b>	150/169 (88.8)	2/169 (1.2)	6/169 (3.6)	11/169 (6.5)
	<b>Resident</b>	153/169 (90.5)	3/169 (1.8)	3/169 (1.8)	10/169 (5.9)
<b>Diameter</b>					
<b>&lt;3 mm</b>	<b>NR</b>	66/81 (81.5)	12/81 (14.8)	2/81 (2.5)	1/81 (1.2)
<b>3-5 mm</b>	<b>NR</b>	76/76 (100)	0/76 (0)	0/76 (0)	0/76 (0)
<b>&gt;5 mm</b>	<b>NR</b>	12/12 (100)	0/12 (0)	0/12 (0)	0/12 (0)
<b>&lt;3 mm</b>	<b>NS</b>	66/81 (81.5)	3/81 (3.7)	2/81 (2.5)	10/81 (12.3)
<b>3-5 mm</b>	<b>NS</b>	75/76 (98.7)	0/76 (0)	1/76 (1.3)	0/76 (0)
<b>&gt;5 mm</b>	<b>NS</b>	12/12 (100)	0/12 (0)	0/12 (0)	0/12 (0)
<b>&lt;3 mm</b>	<b>Radiologist</b>	66/81 (81.5)	2/81 (2.5)	2/81 (2.5)	11/81 (13.6)
<b>3-5 mm</b>	<b>Radiologist</b>	73/76 (96.1)	0/76 (0)	3/76 (3.9)	0/76 (0)
<b>&gt;5 mm</b>	<b>Radiologist</b>	11/12 (91.7)	0/12 (0)	1/12 (8.3)	0/12 (0)
<b>&lt;3 mm</b>	<b>Resident</b>	66/81 (81.5)	3/81 (3.7)	2/81 (2.5)	10/81 (12.3)
<b>3-5 mm</b>	<b>Resident</b>	75/76 (98.7)	0/76 (0)	1/76 (1.3)	0/76 (0)
<b>&gt;5 mm</b>	<b>Resident</b>	12/12 (100)	0/12 (0)	0/12 (0)	0/12 (0)
<b>Volume</b>					
<b>&lt;10 cc</b>	<b>NR</b>	44/58 (75.9)	12/58 (20.7)	1/58 (1.7)	1/58 (1.7)
<b>10-20 cc</b>	<b>NR</b>	51/52 (98.1)	0/52 (0)	1/52 (1.9)	0/52 (0)
<b>&gt;20 cc</b>	<b>NR</b>	59/59 (100)	0/59 (0)	0/59 (0)	0/59 (0)
<b>&lt;10 cc</b>	<b>NS</b>	43/58 (74.1)	3/58 (5.2)	2/58 (3.4)	10/58 (17.2)
<b>10-20 cc</b>	<b>NS</b>	51/52 (98.1)	0/52 (0)	1/52 (1.9)	0/52 (0)
<b>&gt; 20 cc</b>	<b>NS</b>	59/59 (100)	0/59 (0)	0/59 (0)	0/59 (0)
<b>&lt;10 cc</b>	<b>Radiologist</b>	43/58 (74.1)	2/58 (3.4)	2/58 (3.4)	11/58 (19)
<b>10-20 cc</b>	<b>Radiologist</b>	51/52 (98.1)	0/52 (0)	1/52 (1.9)	0/52 (0)
<b>&gt;20 cc</b>	<b>Radiologist</b>	56/59 (94.9)	0/59 (0)	3/59 (5.1)	0/59 (0)
<b>&lt;10 cc</b>	<b>Resident</b>	44/58 (75.9)	3/58 (5.2)	1/58 (1.7)	10/58 (17.2)
<b>10-20 cc</b>	<b>Resident</b>	50/52 (96.2)	0/52 (0)	2/52 (3.8)	0/52 (0)
<b>&gt;20 cc</b>	<b>Resident</b>	59/59 (100)	0/59 (0)	0/59 (0)	0/59 (0)
<b>Location</b>					
<b>ACA major branch</b>	<b>NR</b>	3/5 (60)	2/5 (40)	0/5 (0)	0/5 (0)
<b>Around-dural ring</b>	<b>NR</b>	98/106 (92.5)	7/106 (6.6)	1/106 (0.9)	0/106 (0)
<b>Extra-dural ring</b>	<b>NR</b>	10/12 (83.3)	2/12 (16.7)	0/12 (0)	0/12 (0)
<b>Intracranial distal ICA</b>	<b>NR</b>	23/23 (100)	0/23 (0)	0/23 (0)	0/23 (0)
<b>MCA major branch</b>	<b>NR</b>	17/19 (89.5)	0/19 (0)	1/19 (5.3)	1/19 (5.3)
<b>Posterior circulation</b>	<b>NR</b>	3/4 (75)	1/4 (25)	0/4 (0)	0/4 (0)
<b>ACA major branch</b>	<b>NS</b>	3/5 (60)	1/5 (20)	0/5 (0)	1/5 (20)
<b>Around-dural ring</b>	<b>NS</b>	98/106 (92.5)	1/106 (0.9)	1/106 (0.9)	6/106 (5.7)
<b>Extra-dural ring</b>	<b>NS</b>	10/12 (83.3)	1/12 (8.3)	0/12 (0)	1/12 (8.3)

<b>Intracranial distal ICA</b>	NS	21/23 (91.3)	0/23 (0)	2/23 (8.7)	0/23 (0)
<b>MCA major branch</b>	NS	18/19 (94.7)	0/19 (0)	0/19 (0)	1/19 (5.3)
<b>Posterior circulation</b>	NS	3/4 (75)	0/4 (0)	0/4 (0)	1/4 (25)
<b>ACA major branch</b>	<b>Radiologist</b>	3/5 (60)	0/5 (0)	0/5 (0)	2/5 (40)
<b>Around-dural ring</b>	<b>Radiologist</b>	98/106 (92.5)	1/106 (0.9)	1/106 (0.9)	6/106 (5.7)
<b>Extra-dural ring</b>	<b>Radiologist</b>	10/12 (83.3)	0/12 (0)	0/12 (0)	2/12 (16.7)
<b>Intracranial distal ICA</b>	<b>Radiologist</b>	19/23 (82.6)	0/23 (0)	4/23 (17.4)	0/23 (0)
<b>MCA major branch</b>	<b>Radiologist</b>	17/19 (89.5)	0/19 (0)	1/19 (5.3)	1/19 (5.3)
<b>Posterior circulation</b>	<b>Radiologist</b>	3/4 (75)	1/4 (25)	0/4 (0)	0/4 (0)
<b>ACA major branch</b>	<b>Resident</b>	2/5 (40)	2/5 (40)	1/5 (20)	0/5 (0)
<b>Around-dural ring</b>	<b>Resident</b>	99/106 (93.4)	1/106 (0.9)	0/106 (0)	6/106 (5.7)
<b>Extra-dural ring</b>	<b>Resident</b>	10/12 (83.3)	0/12 (0)	0/12 (0)	2/12 (16.7)
<b>Intracranial distal ICA</b>	<b>Resident</b>	22/23 (95.7)	0/23 (0)	1/23 (4.3)	0/23 (0)
<b>MCA major branch</b>	<b>Resident</b>	17/19 (89.5)	0/19 (0)	1/19 (5.3)	1/19 (5.3)
<b>Posterior circulation</b>	<b>Resident</b>	3/4 (75)	0/4 (0)	0/4 (0)	1/4 (25)

NR, neurologist; NS, neurosurgeon; ACA, anterior cerebral artery; ICA, internal carotid artery; MCA, middle cerebral artery



**Supplemental Figure 1.**

CAD software presented a 1.0 cm × 1.0 cm bounding box, which was expected to contain an aneurysm on final images.

