

INTRODUCTION

Unruptured intracranial aneurysms (UIAs) have an estimated global prevalence between 4-6% with regional stratification. The rupture of an intracranial aneurysm is life-threatening, associated with high rates of morbidity and mortality. Early detection through contrast enhanced imaging is essential for physicians to manage and prevent UIA rupture. Rapid Aneurysm is an Artificial Intelligence platform which detects and measures cerebral aneurysms with 3D reconstruction and localization to aid in assessment and growth tracking. The software automatically segments and analyzes intracranial arteries in the Circle of Willis (COW) and associated vessels. We compared Rapid Aneurysm's diagnostic results to clinical radiology reports in a large sample of CTAs.

METHODS AND MATERIAL

A cohort of 11,694 consecutive CTA studies between September 2020 and June of 2024 for various clinical indications. All scans were read by clinical radiologists and independently by the Rapid Aneurysm software. Primary readers were blinded to Rapid's results. All cases of suspected aneurysms, determined either by Rapid or by the attending radiologist, were subsequently reviewed by senior radiology residents who determined ground truth via full medical record and additional follow-up scan review. In addition, radiology residents independently measured both sets of missed aneurysms. Aneurysms less than 2mm in clinical measurement and Rapid measurement (n=18) in addition to aneurysms located outside of the vascular regions assessed by software (n=13) were considered negative for condition.

RESULTS

Rapid for Aneurysm had a sensitivity = 87.8%, and specificity = 97.8%

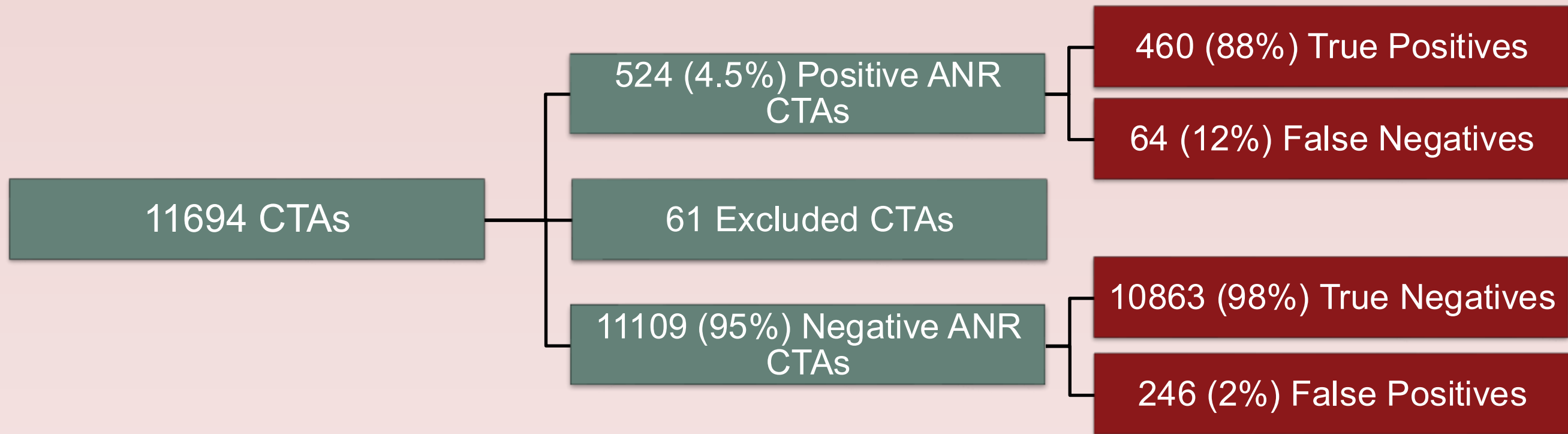


Figure 1: Break down of consecutive, CTA case cohort and RapidAI performance in detecting aneurysms. The green color distinguishes the ground truth and the RapidAI assessment is in deep red for clarity.

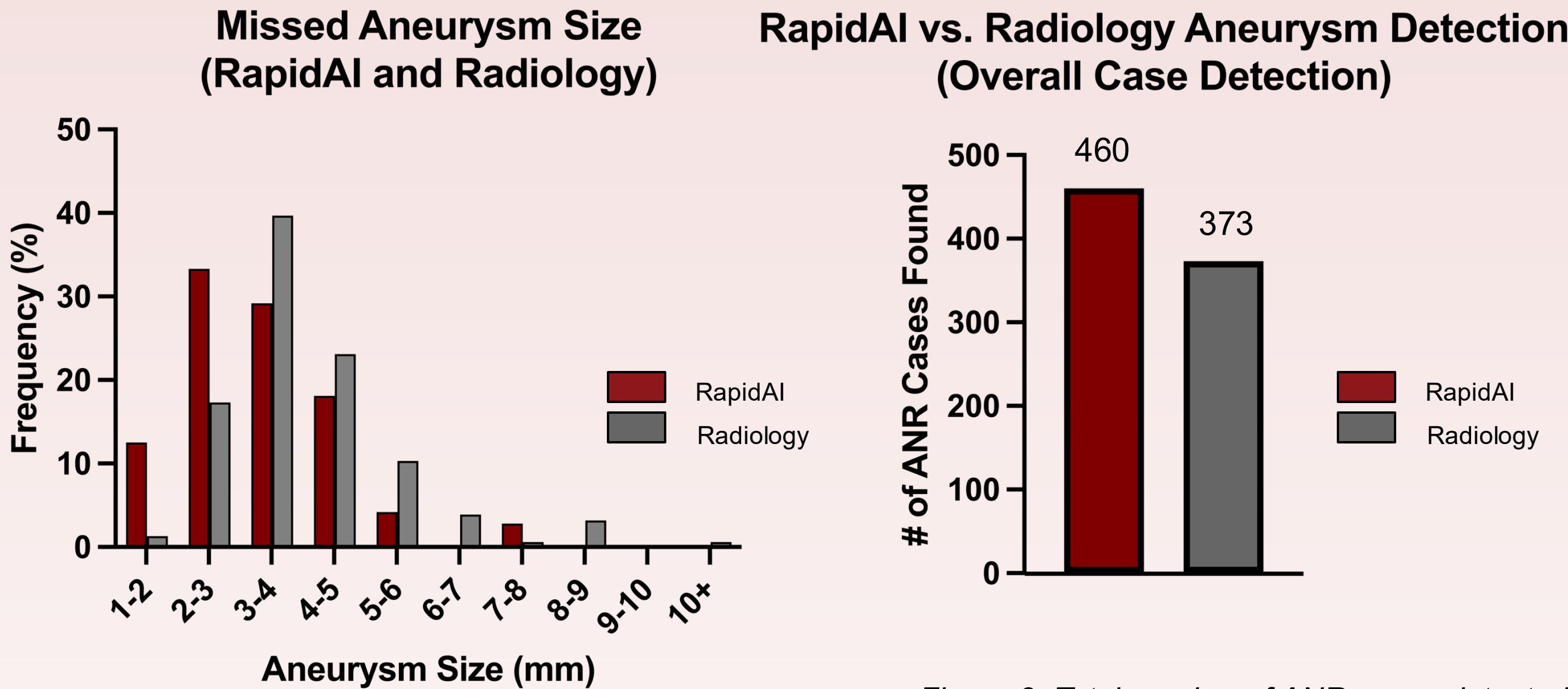


Figure 2: Missed ANR's size and their frequency of occurrence comparatively.

Figure 3: Total number of ANR cases detected compared between RapidAI and radiology.

Vessel Name	Ground Truth # of ANRs (% total)	ANR's Detected		ANR's Missed	
		RapidAI	Radiology	RapidAI	Radiology
ICA	320 (50.6%)	293	208	27	112
MCA	124 (19.6%)	112	106	12	18
ACOM	102 (16.1%)	93	87	9	15
Basilar	34 (5.4%)	31	31	3	3
ACA	25 (4.0%)	21	23	4	2
PCA	17 (2.7%)	15	15	2	2
VA	10 (1.6%)	9	8	1	2

Figure 4: Break down of the confirmed positive ANR CTA's and the performance of RapidAI compared to the radiology team alone in detecting these aneurysms.

RESULTS CONT.

CTA's from 11,633 consecutive studies were included. 61 studies were excluded due to poor image quality, insufficient scan length, duplication, missing patient records, or imaging artifacts. Confirmed aneurysms were present in 524 (4.5%) studies. Rapid correctly identified 460 aneurysms, sensitivity 87.8%, CI:0.85-0.90 and 10,863 aneurysm-negative studies, specificity 97.8%, CI:0.97-0.98, positive predictive value 65.2%, CI:0.62%-0.69%, and negative predictive value 99.4%, CI:0.99.2-0.99.5. Radiologists detected 373 aneurysms. Rapid identified 150 aneurysms missed by radiology with measurements derived by Rapid (median max dimension: 3.9mm (2.26-13.8mm) while radiologists detected 63 aneurysms missed by Rapid with measurements derived by radiology reports (median: 3mm (2-5mm)). Figure 2 presents resident measurements of both radiology (median: 3.6mm (1.6-12.6mm) and Rapid (median: 3.1mm (1.4-7.1mm)).

CONCLUSION

This study demonstrates that AI not only achieves high accuracy in detecting intracranial aneurysms but also identified a substantial number of potentially clinically relevant aneurysms that were missed by radiologists. These findings underscore AI's potential to enhance diagnostic accuracy, supporting clinicians in the early detection and management of aneurysms.

REFERENCES

- Ortiz AFH et al. Prevalence and risk factors of unruptured intracranial aneurysms in ischemic stroke patients – A global meta-analysis. *Surgical Neurology International*. 2023;14(222):1-14
- Owens MR, et al. Systematic Review of Radiomics and Artificial Intelligence in Intracranial Aneurysm Management. *J Neuroimaging*. 2025; 35(2):e70037

FINANCIAL DISCLOSURES

RD and DF are consultants to IschemaView Inc.