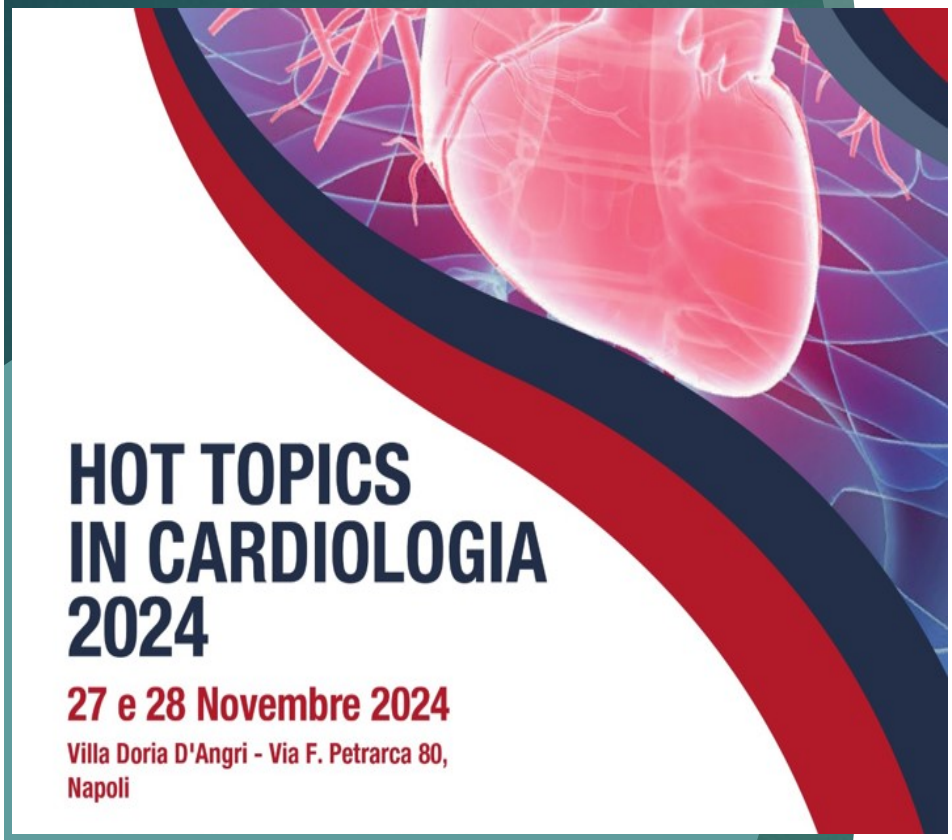

Press Review

Federica de Fazio
UOC Cardiologia UTIC ed Emodinamica
AORN Cardarelli

Original Article

Coronary microvascular dysfunction and myocardial area at risk assessed by cadmium zinc telluride single photon emission computed tomography after primary percutaneous coronary intervention in acute myocardial infarction patients

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Contributions: (I) Conception and design: Yongde Wang, J Li, K Chen; (II) Administrative support: Yongde Wang, J Li, K Chen; (III) Provision of study materials or patients: L Cui, Yangchongzi Wang, W Chen, P Huang, J Wang, Z Tang; (IV) Collection and assembly of data: L Cui, Yangchongzi Wang, Z Tang, P Huang; (V) Data analysis and interpretation: L Cui, Yangchongzi Wang, P Huang; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

#These authors contributed equally to this work.

LO SCOPO

Valutare la prevalenza della CMD

come una riserva di flusso miocardico (MFR) <2.0 e stenosi residua dell'arteria correlata all'infarto (IRA) <50%

Analizzare le caratteristiche funzionali della CMD

Identificare i valori di flusso sanguigno a riposo e sotto stress (MBF)

Quantificare l'estensione del miocardio a rischio (AAR):

Identificare i fattori predittivi di CMD

Esplorare le implicazioni prognostiche della CMD

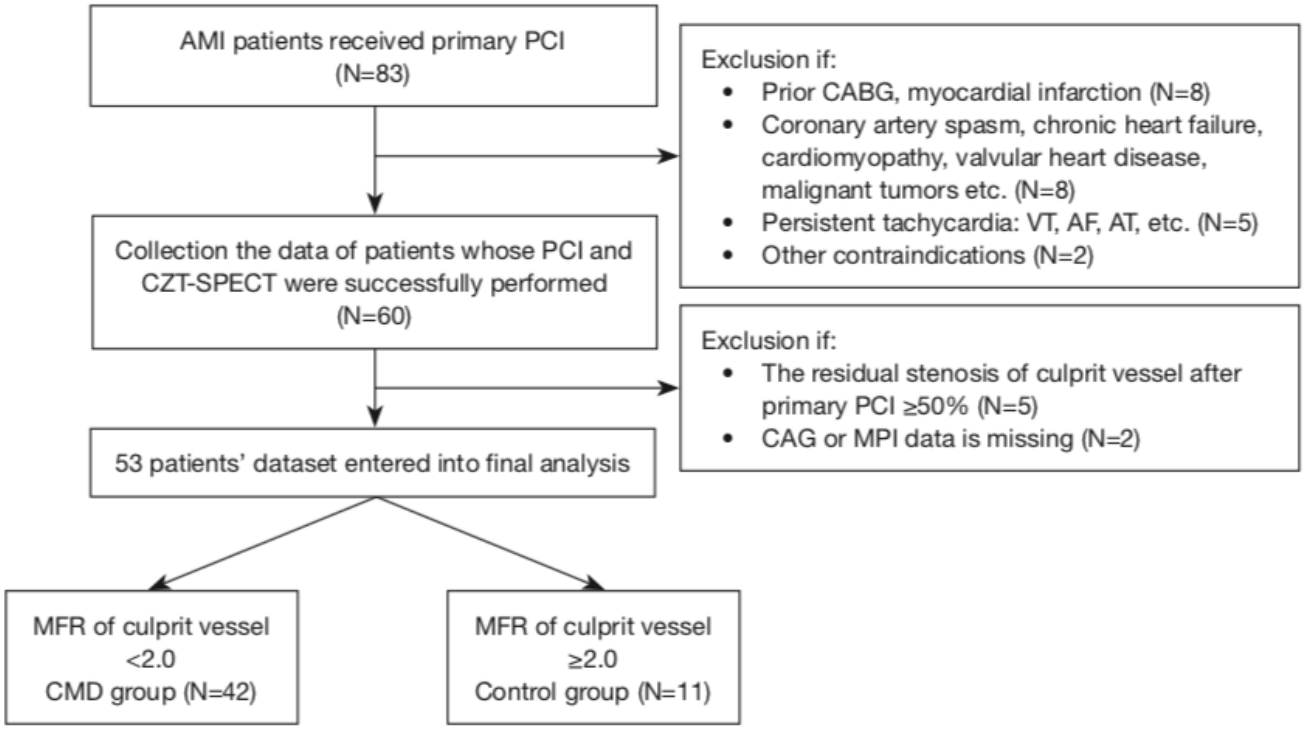

Figure 1 Inclusion flow chart. AMI, acute myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; VT, ventricular tachycardia; AF, atrial fibrillation; AT, atrial tachycardia; CZT, cadmium zinc telluride; SPECT, single photon emission computed tomography; CAG, coronary angiography; MPI, myocardial perfusion imaging; MFR, myocardial flow reserve; CMD, coronary microvascular dysfunction.

Table 3 Comparison of SPECT imaging parameters between CMD and control group

Variable	CMD group (N=42)	Control group (N=11)	*t* or z*	P value
Pain to SPECT imaging (d)	7.50±1.27	7.45±1.86	0.095	0.924
Rest-MBF of IRA (mL/g/min)	0.72±0.18	0.785±0.15	–1.116	0.270
Stress-MBF of IRA (mL/g/min)	0.80±0.31	1.93±0.44	–9.688	<0.001
MFR of IRA	1.16±0.46	2.49±0.45	–8.644	<0.001
SSS score	11.0 (6.0, 18.8)	2 (1.8, 8.2)	2.875	0.004
SRS score	4.0 (1.0, 10.0)	1.5 (0.0, 3.3)	1.984	0.047
SDS score	6.0 (2.0, 8.0)	2.0 (0.0, 5.0)	2.090	0.037
Rest-defect-size (cm^2)	6.0 (1.0, 25.0)	1.0 (0.0, 4.3)	2.091	0.037
Stress-defect-size (cm^2)	16.0 (8.0, 28.0)	3.0 (0.0, 11.3)	2.993	0.003
Rest-AAR (%)	6.0 (1.0, 20.3)	1.0 (0.0, 4.0)	2.197	0.028
Stress-AAR (%)	21.5 (9.8, 35.3)	3.0 (0.0, 15.0)	3.326	0.001
Rest-LVEF (%)	50.72±9.67	60.56±6.78	–2.880	0.006
Stress-LVEF (%)	49.08±9.68	60.22±6.99	–3.251	0.002

Values were given as mean ± SD or medium values (P25, P75). *t, grouped comparison using student *t*-test; z, grouped comparison using Mann-Whitney method. SPECT, single photon emission computed tomography; CMD, coronary microvascular dysfunction; MBF, myocardial blood flow; d, days; IRA, infarct-related artery; MFR, myocardial flow reserve; SSS, summed stress score; SRS, summed rest score; SDS, summed difference score; AAR, area at risk; LVEF, left ventricular ejection fraction; SD, standard deviation.

Table 4 Multivariate logistic regression analysis for the risk factors of CMD

Variable	β	SE	Waldχ^2	OR (95% CI)	P value
BMI (kg/m^2)	0.287	0.142	4.057	1.332 (1.008–1.760)	0.044
STEMI (yes/no)	–0.510	0.999	0.261	0.601 (0.085–4.252)	0.610
TIMI of IRA prior PCI	–0.202	0.381	0.280	0.817 (0.387–1.726)	0.597
Pain to reperfusion (h)	0.158	0.203	0.610	1.172 (0.787–1.744)	0.435
Stress-AAR (0% as reference)	0.690	0.293	5.539	1.994 (1.122–3.543)	0.019

CMD, coronary microvascular dysfunction; SE, standard error; OR, odds ratio; CI, confidence interval; BMI, body mass index; STEMI, ST-elevation myocardial infarction; TIMI, thrombolysis in myocardial infarction; IRA, infarct-related artery; PCI, percutaneous coronary intervention; AAR, area at risk.

I Risultati

CMD è altamente prevalente nei pazienti con AMI trattati con PCI primario e si associa a una ridotta capacità di riserva coronarica.

Parametri come BMI e Stress-AAR si sono rivelati predittori indipendenti della CMD, fornendo obiettivi utili per la gestione clinica e la stratificazione del rischio.

La SPECT si è dimostrata una tecnica affidabile per valutare la microcircolazione e la funzione coronarica, migliorando la comprensione delle complicanze post-PCI e le possibilità terapeutiche.

Coronary computed tomography angiographic detection of in-stent restenosis via deep learning reconstruction: a feasibility study

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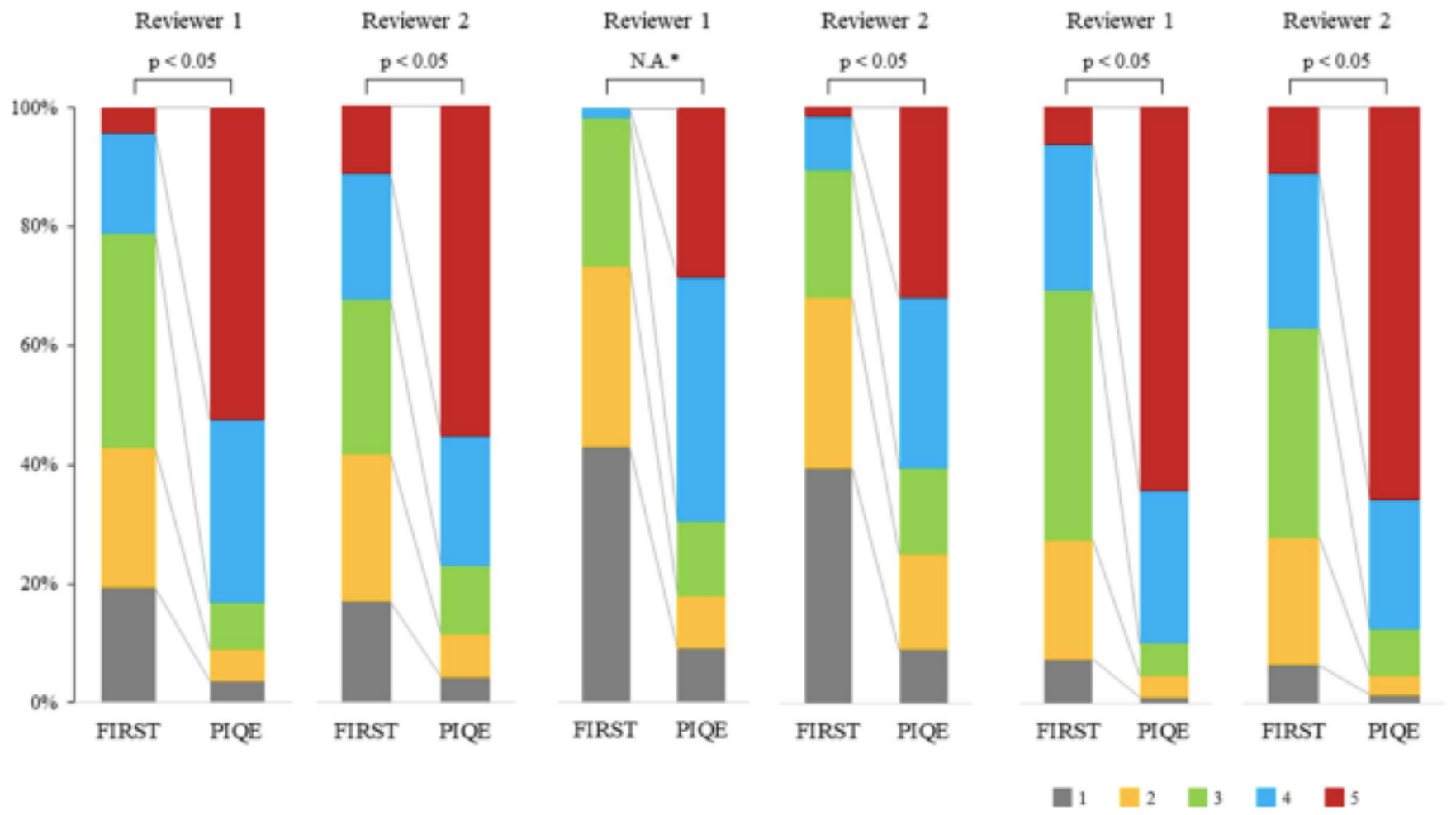
Reviewer 1
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p < 0.05
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100%
80%
60%
40%
20%
0%
FIRST
PIQE
1
2
3
4
5

Table 4 Diagnostic accuracy of CTA for the detection of in-stent restenosis in ICA

		N	TP	TN	FP	FN	Sensitivity (%, *p*-value)		Specificity (%, *p*-value)		PPV (%, *p*-value)	NPV (%, *p*-value)	Accuracy (%, *p*-value)	
Patient-based analysis														
Rev.1	FIRST	85	9	50	20	6	60.0 (32.3–83.7)	0.06	71.4 (59.4–81.6)	< 0.05	31.0 (15.3–50.8)	89.3 (78.1–96.0)	69.4 (58.5–79.0)	< 0.05
	PIQE	85	14	64	6	1	93.3 (68.1–99.8)		91.4 (82.3–96.8)		70.0 (45.7–88.1)	98.5 (91.7–100.0)	91.8 (83.8–96.6)	
Rev.2	FIRST	85	10	51	19	5	66.7 (38.4–88.2)	0.25	72.9 (60.9–82.8)	< 0.05	34.5 (17.9–54.3)	91.1 (80.4–97.0)	71.8 (61.0–81.0)	< 0.05
	PIQE	85	13	63	7	2	86.7 (59.5–98.3)		90.0 (80.5–95.9)		65.0 (40.8–84.6)	96.9 (89.3–99.6)	89.4 (80.8–95.0)	
Stent-based analysis														
All stents														
Rev.1	FIRST	166	15	113	35	3	83.3 (58.6–96.4)	1.00	76.4 (68.7–82.9)	< 0.05	30.0 (17.9–44.6)	97.4 (92.6–99.5)	77.1 (70.0–83.3)	< 0.05
	PIQE	166	16	134	14	2	88.9 (65.3–98.6)		90.5 (84.6–94.7)		53.3 (34.3–71.7)	98.5 (94.8–99.8)	90.4 (84.8–94.4)	
Rev.2	FIRST	166	14	116	32	4	77.8 (52.4–93.6)	1.00	78.4 (70.9–84.7)	< 0.05	30.4 (17.7–45.8)	96.7 (91.7–99.1)	78.3 (71.3–84.3)	< 0.05
	PIQE	166	15	131	17	3	83.3 (58.6–96.4)		88.5 (82.2–93.2)		46.9 (29.1–65.3)	97.8 (93.6–99.5)	88.0 (82.0–92.5)	
< 3.0-mm stent diameter														
Rev.1	FIRST	56	6	27	22	1	85.7 (42.1–99.6)	1.00	55.1 (40.2–69.3)	< 0.05	21.4 (8.3–41.0)	96.4 (81.7–99.9)	58.9 (45.0–71.9)	< 0.05
	PIQE	56	6	41	8	1	85.7 (42.1–99.6)		83.7 (70.3–92.7)		42.9 (17.7–71.1)	97.6 (87.4–99.9)	83.9 (71.7–92.4)	
Rev.2	FIRST	56	5	28	21	2	71.4 (29.0–96.3)	1.00	57.1 (42.2–71.2)	< 0.05	19.2 (6.6–39.4)	93.3 (77.9–99.2)	58.9 (45.0–71.9)	< 0.05
	PIQE	56	6	39	10	1	85.7 (42.1–99.6)		79.6 (65.7–89.8)		37.5 (15.2–64.6)	97.5 (86.8–99.9)	80.4 (67.6–89.8)	
≥ 3.0-mm stent diameter														
Rev.1	FIRST	110	9	86	13	2	81.8 (48.2–97.7)	1.00	86.9 (78.6–92.8)	0.16	40.9 (20.7–63.6)	97.7 (92.0–99.7)	86.4 (78.5–92.2)	0.07
	PIQE	110	10	93	6	1	90.9 (58.7–99.8)		93.9 (87.3–97.7)		62.5 (35.4–84.8)	98.9 (94.2–100.0)	93.6 (87.3–97.4)	
Rev.2	FIRST	110	9	88	11	2	81.8 (48.2–97.7)	1.00	88.9 (81.0–94.3)	0.13	45.0 (23.1–68.5)	97.8 (92.2–99.7)	88.2 (80.6–93.6)	0.13
	PIQE	110	9	92	7	2	81.8 (48.2–97.7)		92.9 (86.0–97.1)		56.2 (29.9–80.2)	97.9 (92.5–99.7)	91.8 (85.0–96.2)	

TP, true positive; *TN*, true negative; *FP*, false positive; *FN*, false negative; *Rev.*, reviewer; *FIRST*, Forward projected model-based Iterative Reconstruction SoluTion; *PIQE*, Precise IQ Engine

Implicazioni dei risultati

Stent di piccolo diametro (<3.0 mm):

- La superiorità di PIQE nella visualizzazione di stent di piccole dimensioni è particolarmente significativa, dato che rappresentano un'area critica per l'identificazione della restenosi.

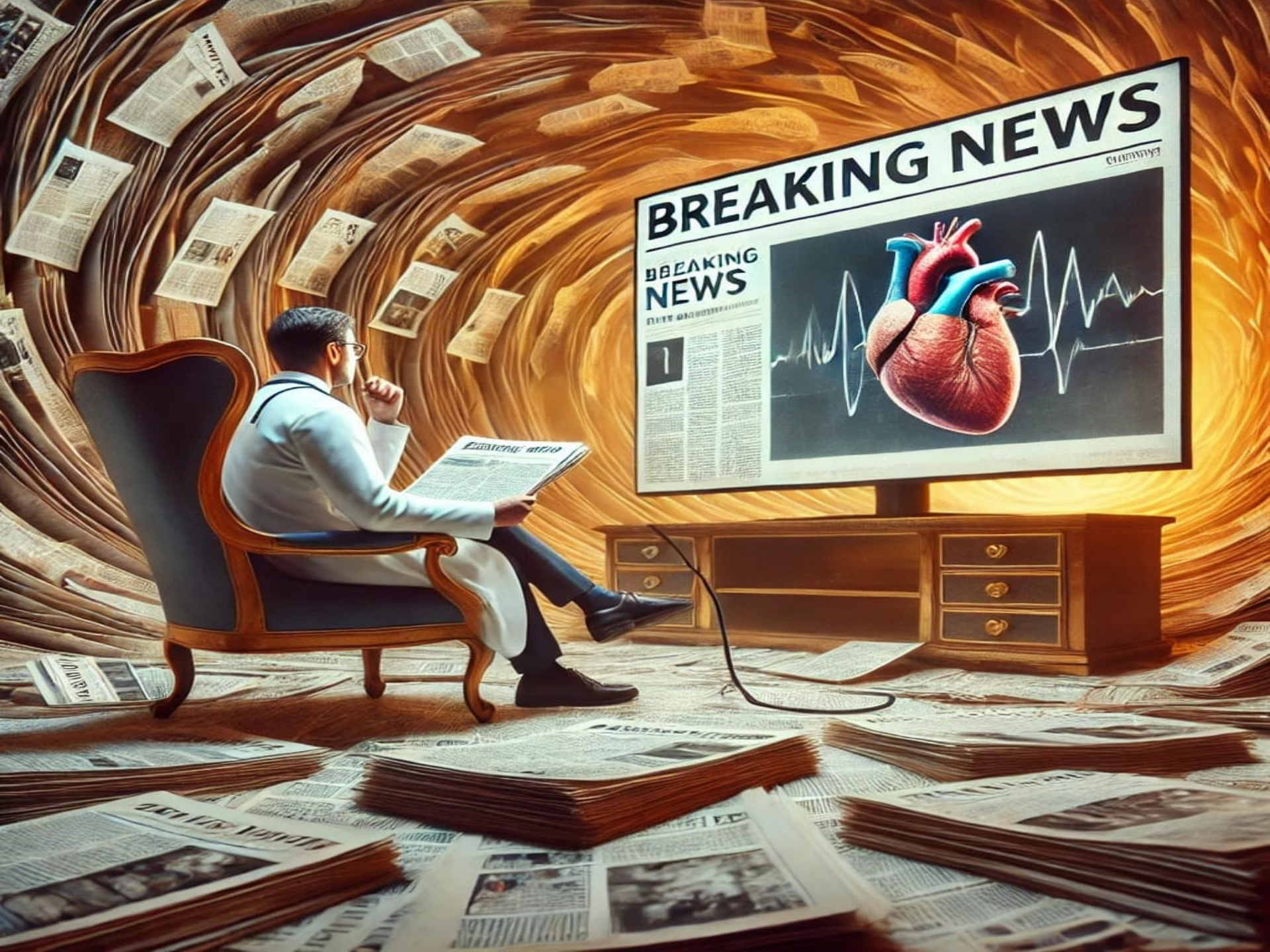
Minimizzazione degli artefatti:

- PIQE riduce significativamente l'artefatto di "blooming" causato dagli strati dello stent, migliorando la diagnosi di ISR.

Possibile riduzione della necessità di ICA:

- Con l'accuratezza diagnostica migliorata, la CTA ricostruita con PIQE potrebbe fungere da "gatekeeper", riducendo la necessità di angiografie coronariche invasive nei pazienti con ISR sospetta.

In sintesi, PIQE rappresenta un significativo passo avanti nel miglioramento della diagnosi di ISR, con un impatto clinico rilevante, specialmente nei casi più complessi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BREAKING NEWS