

# HOT TOPICS IN CARDIOLOGIA 2023

13 e 14 Novembre 2023

Villa Doria D'Angri - Via F. Petrarca 80,  
Napoli

***LA MEDICINA NUCLEARE NELLA VALUTAZIONE NON  
INVASIVA ANATOMICA E FUNZIONALE DELLA CAD***

*Mara Catalano*

Patient Name: |

Study Name: Myocardial Perfusion

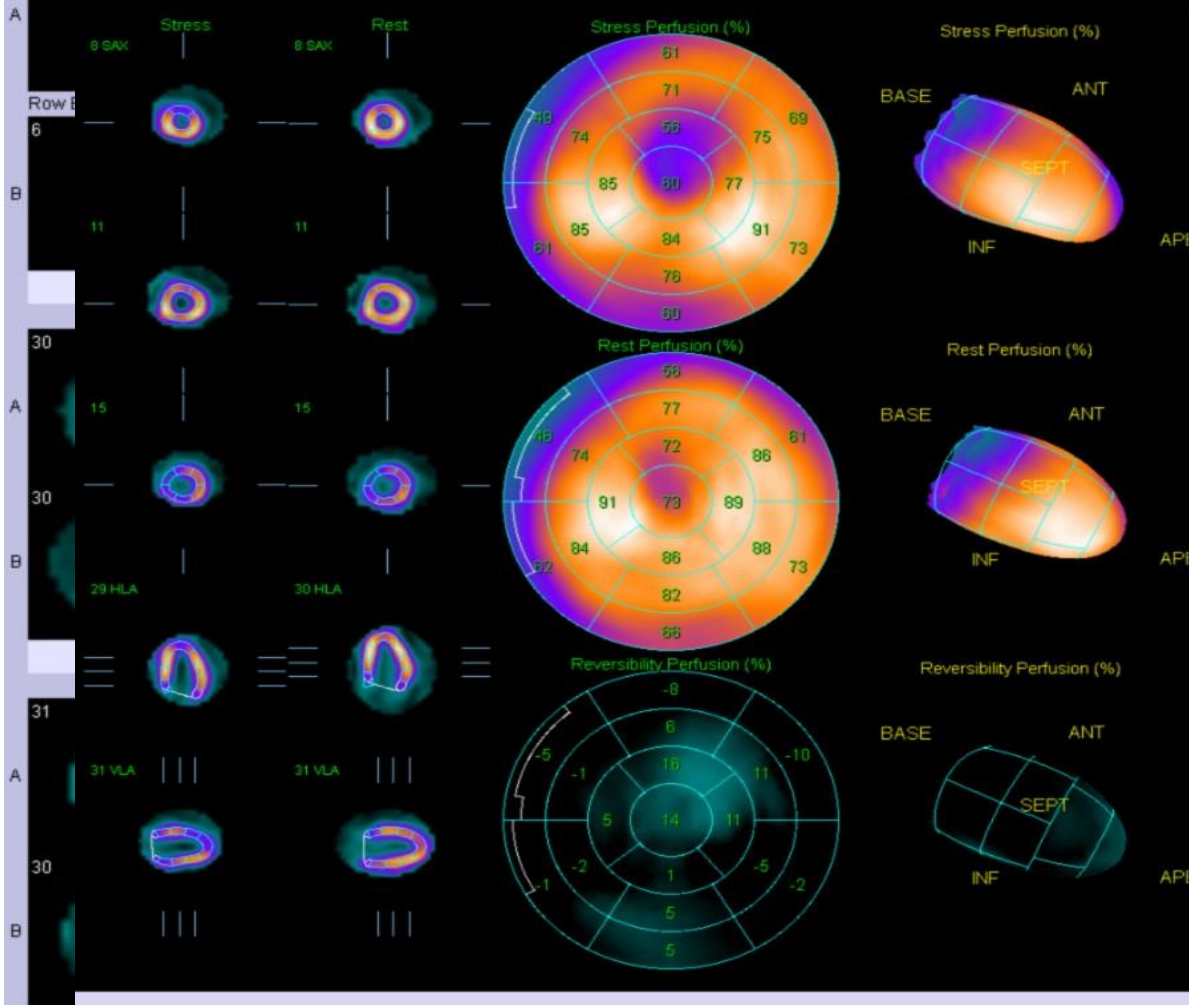
Study Date: 26-Oct-22

Row A - Stress [FBP - NoAC]

SA

6 7 8 9 10 11 12 %

SAVINGS SCREENS: OPS: Splash 28-Oct-22



Name	[Redacted]				
Pat ID	[Redacted]				
Sex	FEMALE				
Limits	--				
SSS	0	SRS	0	SDS	0
SS%	12	SR%	0	SD%	12

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Study	Myocardial Perfusion
Dataset	Stress [FBP - NoAC]
Date	2022-10-26 12:28:56
Database	FemaleStressMB
Volume	64ml
Area	111cm <sup>2</sup>
Defect	11cm <sup>2</sup>
Extent	10%
TPD	0%
Shape	0.56 [SI], 0.86 [Ecc]

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Study	Myocardial Perfusion
Dataset	Rest [FBP - NoAC]
Date	2022-10-27 11:57:59
Database	FemaleRestMB
Volume	77ml
Area	119cm <sup>2</sup>
Defect	2cm <sup>2</sup>
Extent	2%
TPD	4%
Shape	0.56 [SI], 0.84 [Ecc]

Auto 0 | Grid | Accept | Reject

Anterior  
Inferior

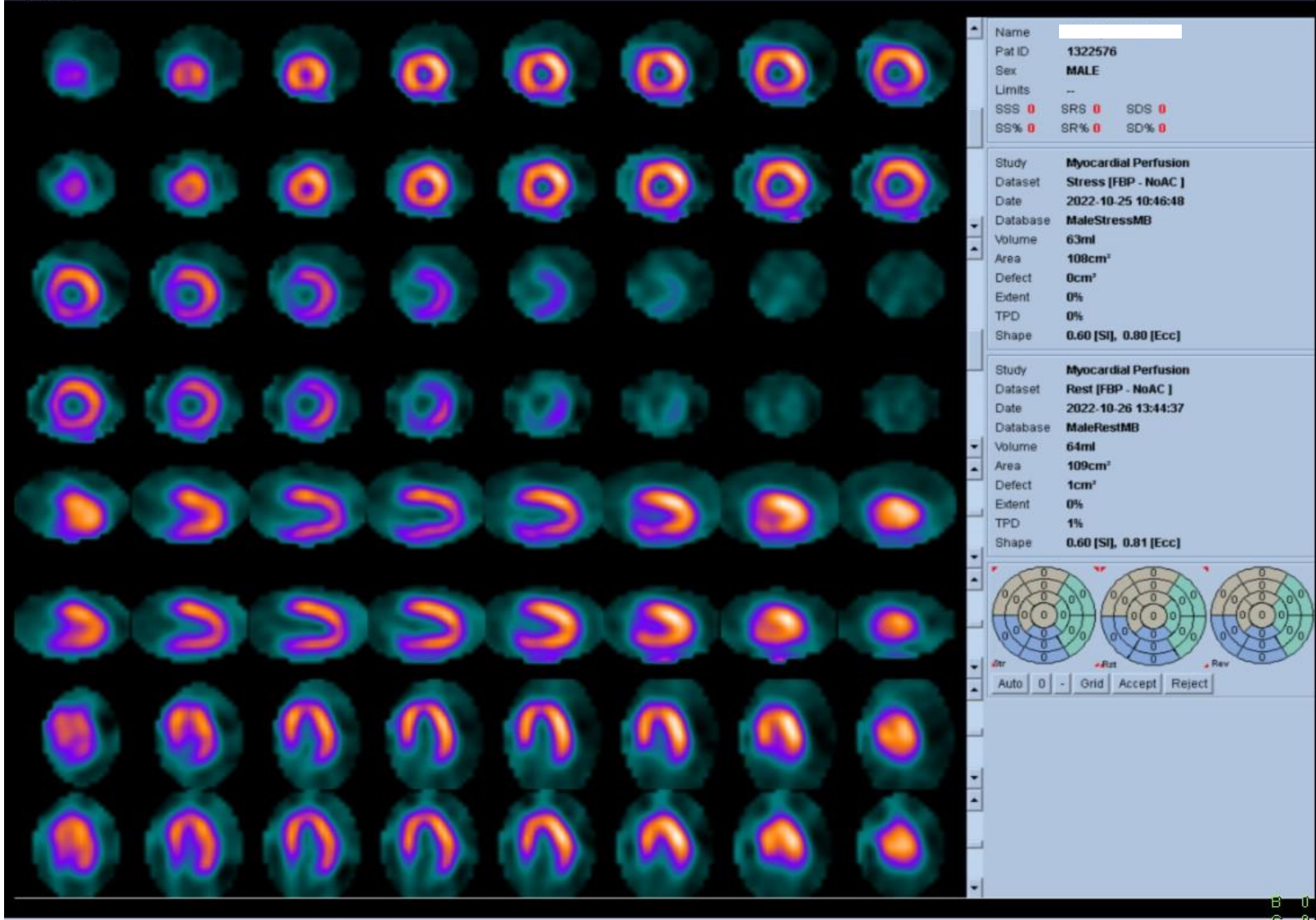
SA to Base

Anterior  
Inferior

Septal to Lateral

SA  
Base

Anterior  
Inferior

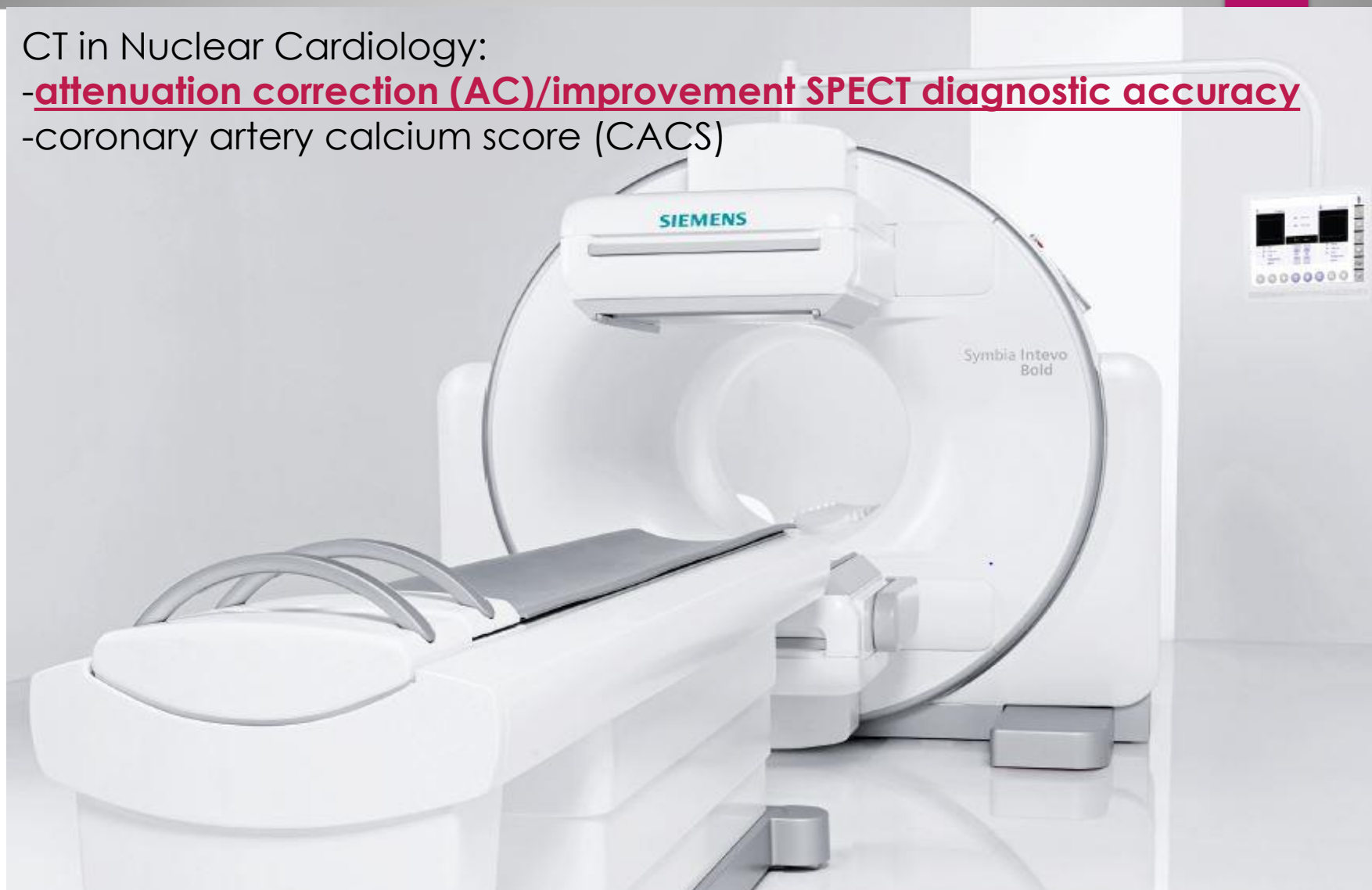


B U  
C D

## The impact of using a hybrid system in the interpretation of the nuclear images

CT in Nuclear Cardiology:

- attenuation correction (AC)/improvement SPECT diagnostic accuracy
- coronary artery calcium score (CACs)



*UOC Medicina Nucleare AORN A.Cardarelli*

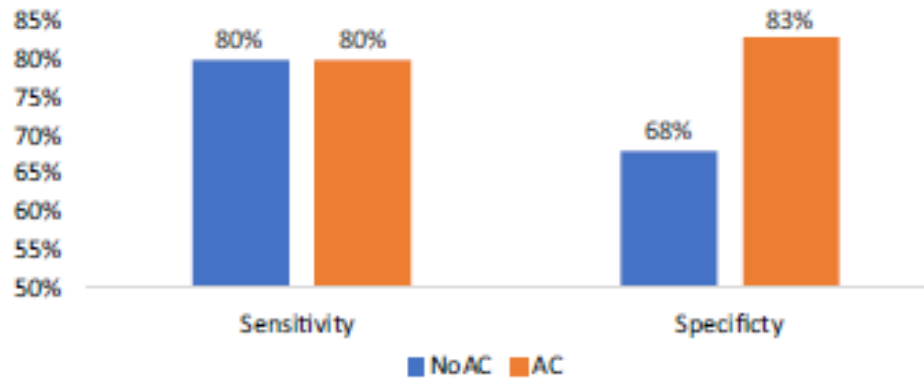
**Table 1.** Summary of studies evaluating the impact of attenuation correction on the sensitivity and specificity of SPECT myocardial perfusion imaging

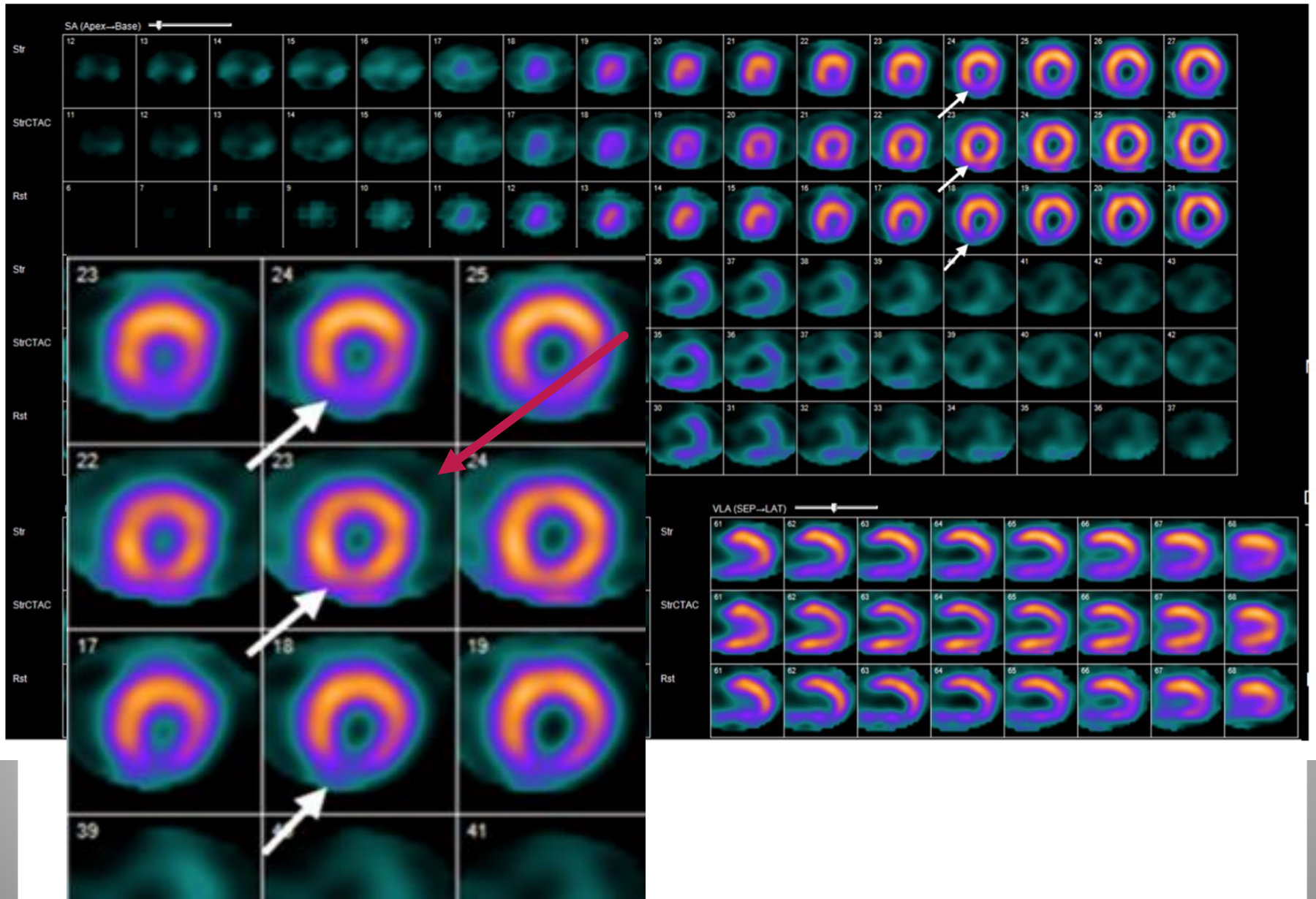
Reference	n	Age (years) (SD)	% Male	Tracer	CAD definition	AC sensitivity	AC specificity	NAC sensitivity	NAC specificity
Sharma <sup>15</sup>	171	55 (10)	82	<sup>99m</sup> Tc	> 50%	0.57	0.89	0.65	0.83
Genovesi <sup>12</sup>	104	64 (10)	79	<sup>99m</sup> Tc	> 70% LM > 50%	0.75	0.81	n/a	n/a
Huang <sup>22</sup>	99	62 (12)	56	<sup>99m</sup> Tc	> 70%	0.92	0.79	0.95	0.63
Masood <sup>14</sup>	118	61 (12)	67	<sup>99m</sup> Tc	> 50%	0.94	0.59	0.93	0.56
Utsunomiya <sup>16</sup>	30	68 (-)*	60	<sup>201</sup> Tl	> 50%	0.76	0.93	0.67	0.86
Arsanjani <sup>19</sup>	463	64 (12)	57	<sup>99m</sup> Tc	≥ 70%	0.84	0.88	0.83	0.81
Summary	525	60	n/a	n/a	n/a	0.80	0.83	0.73	0.68

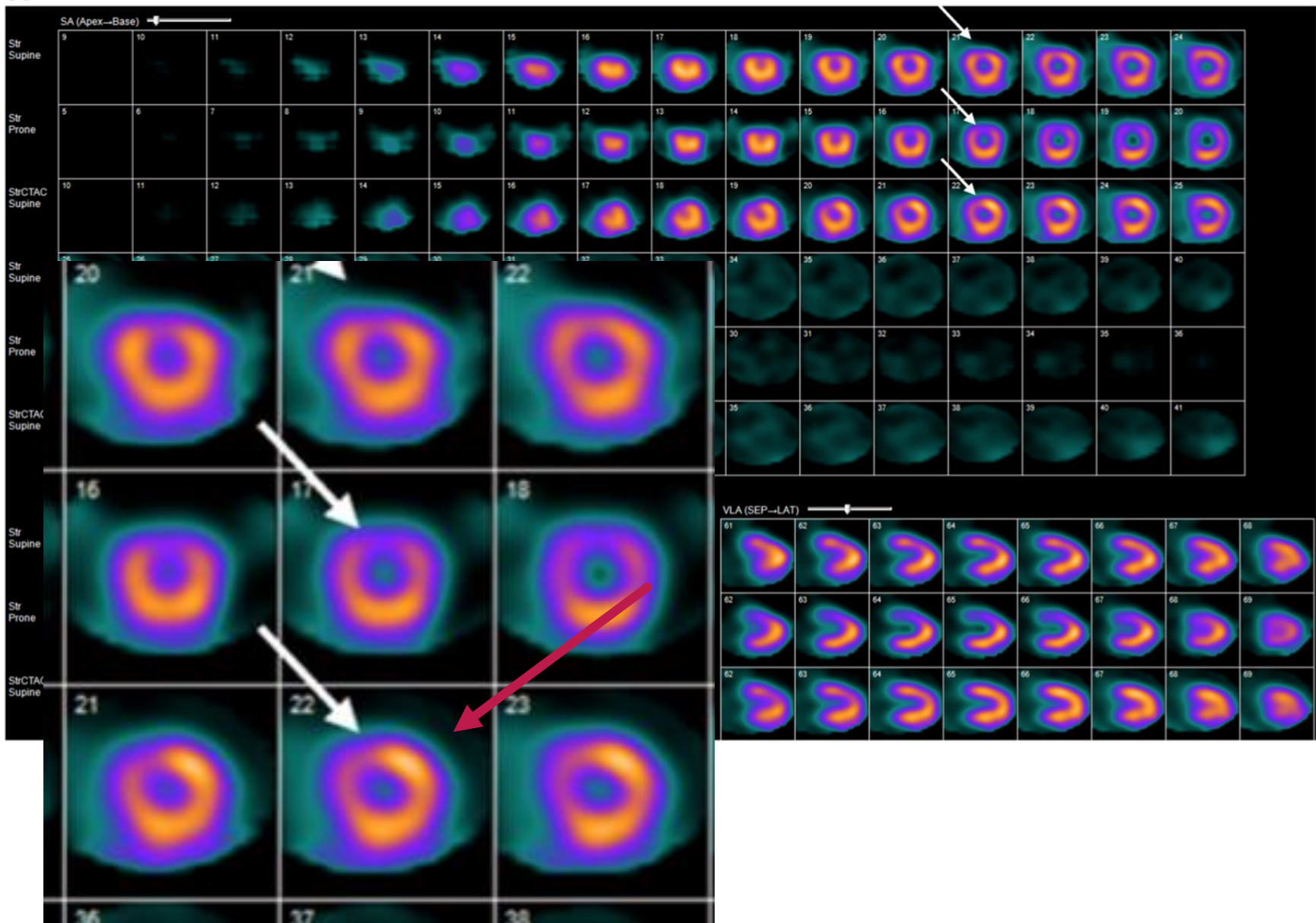
Adapted in part from Huang et al<sup>13</sup>

AC, attenuation correction; CAD, coronary artery disease; LM, left main coronary artery; NAC, non-attenuation correction; SD, standard deviation

\*No available information in included study







## The impact of using a hybrid system in the interpretation of the nuclear images

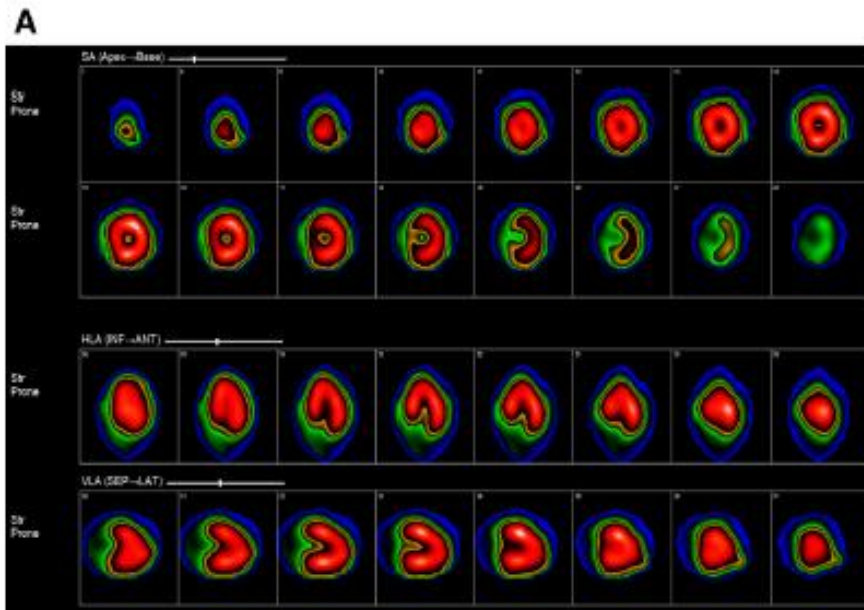
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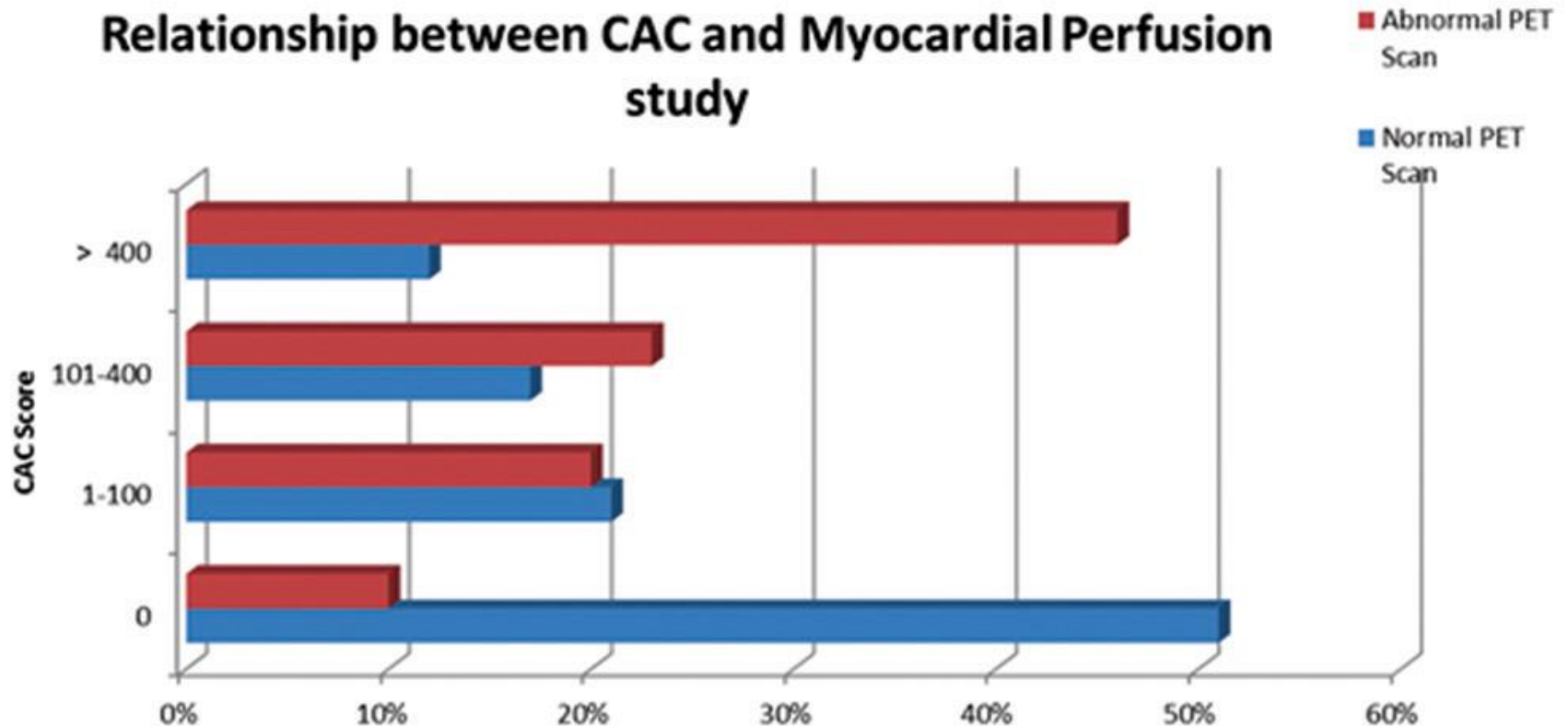
*UOC Medicina Nucleare AORN A.Cardarelli*



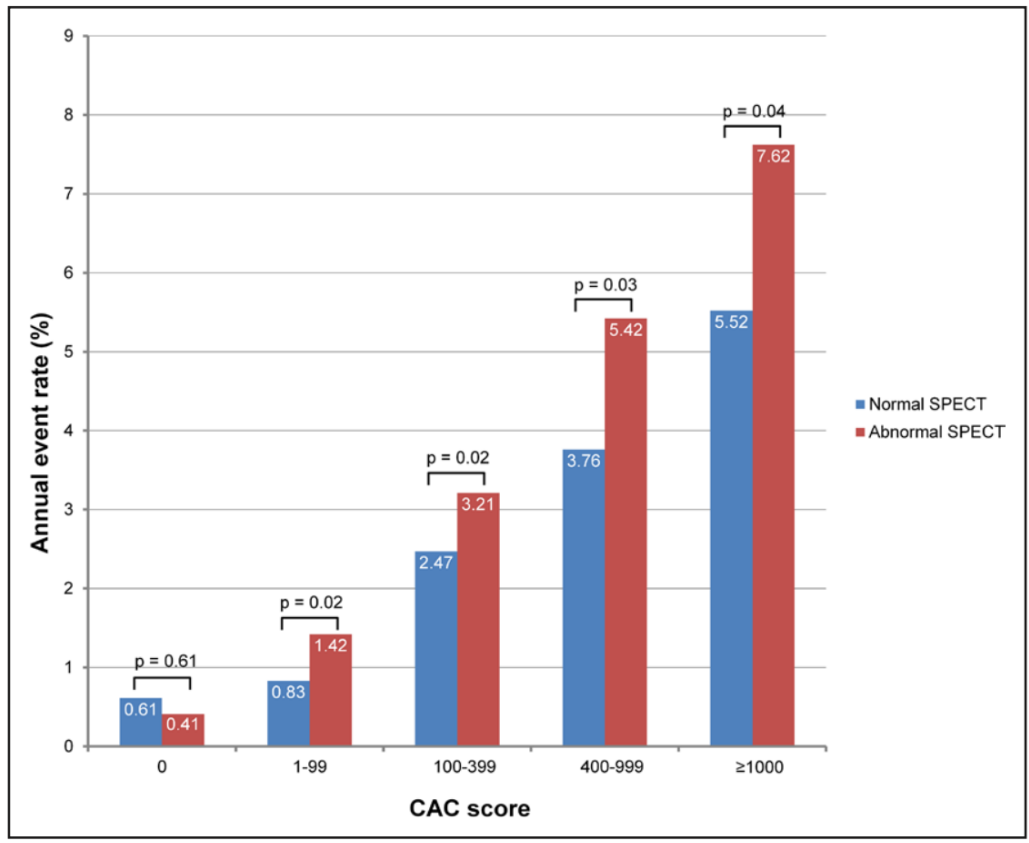


- **Correzione fattori di rischio**
- **Aderenza alla cura**

## Relationship between CAC and Myocardial Perfusion study



A hybrid approach comprising myocardial perfusion imaging and coronary CTA may improve diagnostic performance for detecting obstructive CAD



**Figure 2.** Incidence of major adverse cardiac events (MACEs) stratified by coronary artery calcium (CAC) score and single-photon emission computed tomography (SPECT).

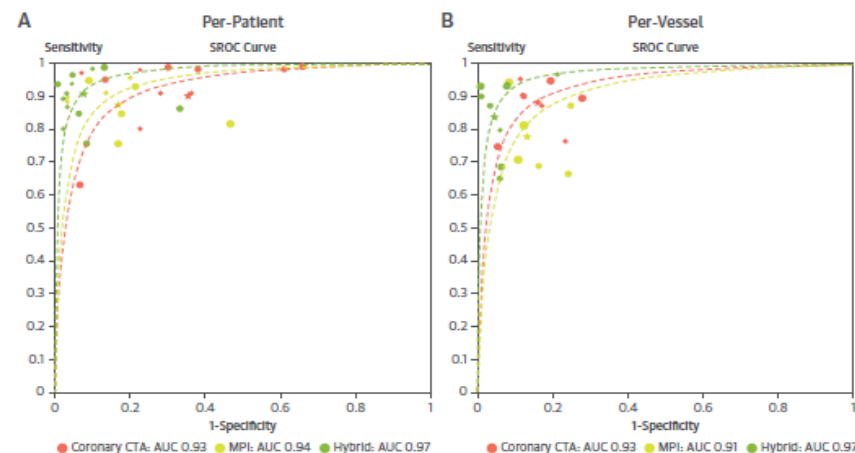
# A hybrid approach comprising myocardial perfusion imaging and coronary CTA may improve diagnostic performance for detecting obstructive CAD

**TABLE 3** Meta-Analysis for the Diagnostic Performance of Coronary CTA Alone, MPI Alone, and Hybrid Cardiac Imaging

	N	Sensitivity (95% CI)	Specificity (95% CI)	Positive Likelihood Ratio (95% CI)	Negative Likelihood Ratio (95% CI)	Diagnostic Odds Ratio (95% CI)
<b>Per-patient analysis</b>						
Coronary CTA	12	0.90 (0.87-0.92)	0.66 (0.61-0.70)	3.39 (2.22-5.17)	0.06 (0.02-0.23)	53.80 (28.61-101.19)
MPI	9	0.87 (0.83-0.90)	0.83 (0.78-0.87)	5.02 (2.99-8.44)	0.15 (0.09-0.25)	39.55 (15.64-100.02)
Hybrid	12	0.91 (0.88-0.93)	0.93 (0.90-0.95)	12.80 (6.56-24.96)	0.11 (0.07-0.18)	159.00 (57.42-440.25)
<b>Per-vessel analysis</b>						
Coronary CTA	8	0.89 (0.86-0.91)	0.83 (0.81-0.85)	5.75 (4.00-8.26)	0.14 (0.09-0.22)	44.27 (25.39-77.20)
MPI	6	0.78 (0.74-0.81)	0.87 (0.84-0.89)	5.24 (3.52-7.82)	0.25 (0.16-0.39)	22.59 (10.41-49.03)
Hybrid	8	0.84 (0.81-0.87)	0.95 (0.94-0.96)	16.53 (9.14-29.90)	0.14 (0.07-0.26)	137.90 (53.93-352.66)

CI = confidence interval; CTA = computed tomography angiography; hybrid = hybrid cardiac imaging encompassing single-photon emission computed tomography, positron emission tomography, and cardiac magnetic resonance; MPI = myocardial perfusion imaging.

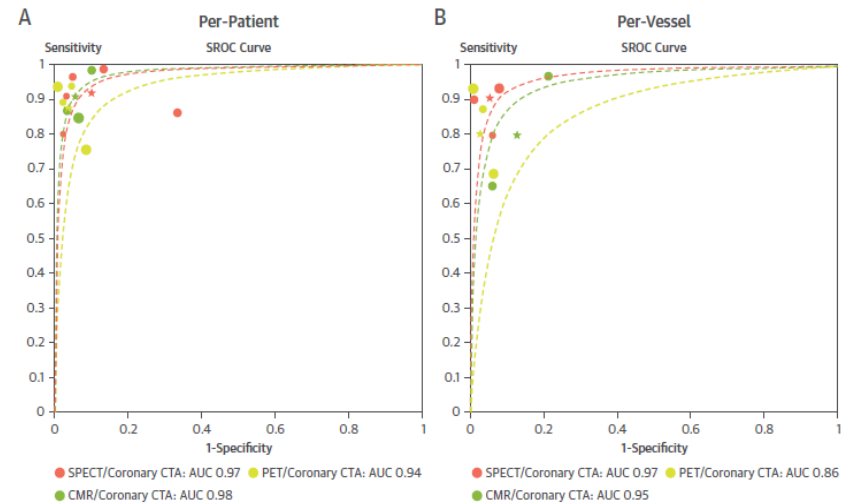
**FIGURE 3** SROC Curves Displaying Diagnostic Performance of Hybrid Imaging Versus Stand-Alone Coronary CTA and MPI



**TABLE 4** Meta-Analysis for the Diagnostic Performance of Various Hybrid Cardiac Imaging Modalities

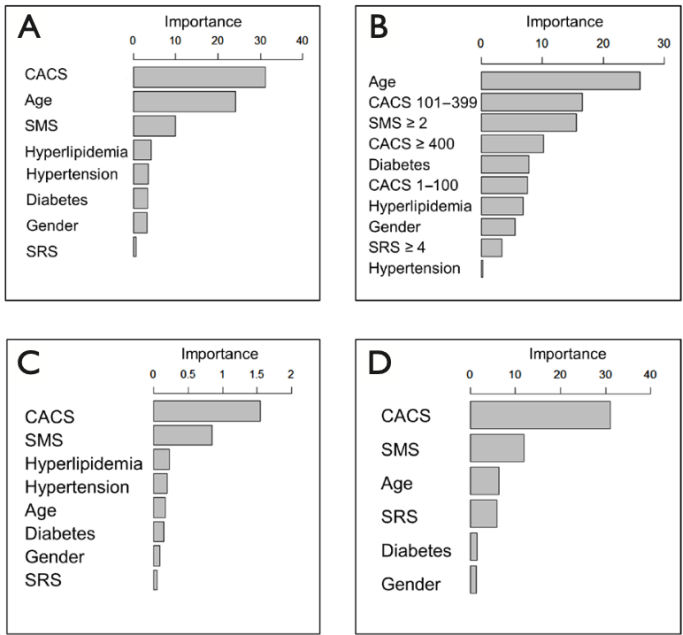
	N	Sensitivity (95% CI)	Specificity (95% CI)	Positive Likelihood Ratio (95% CI)	Negative Likelihood Ratio (95% CI)	Diagnostic Odds Ratio (95% CI)
<b>Per-patient analysis</b>						
SPECT/coronary CTA	5	0.92 (0.88-0.95)	0.90 (0.85-0.93)	10.38 (3.60-29.94)	0.08 (0.03-0.27)	158.16 (21.11-1185.00)
PET/coronary CTA	4	0.87 (0.80-0.92)	0.96 (0.92-0.99)	22.12 (5.20-94.00)	0.12 (0.05-0.29)	213.68 (25.94-1760.10)
CMR/coronary CTA	3	0.91 (0.83-0.96)	0.94 (0.88-0.98)	12.86 (5.90-28.02)	0.13 (0.07-0.26)	120.36 (35.42-408.98)
<b>Per-vessel analysis</b>						
SPECT/coronary CTA	3	0.91 (0.86-0.95)	0.95 (0.93-0.96)	18.51 (8.01-42.76)	0.11 (0.05-0.24)	174.33 (52.59-577.89)
PET/coronary CTA	3	0.81 (0.75-0.86)	0.97 (0.95-0.98)	28.42 (7.68-105.17)	0.15 (0.04-0.51)	202.03 (19.51-2091.8)
CMR/coronary CTA	2	0.80 (0.73-0.87)	0.87 (0.79-0.92)	6.37 (2.69-15.07)	0.13 (0.01-2.07)	53.95 (13.48-215.83)

**FIGURE 4** SROC Curves Displaying the Diagnostic Performance of Hybrid Imaging

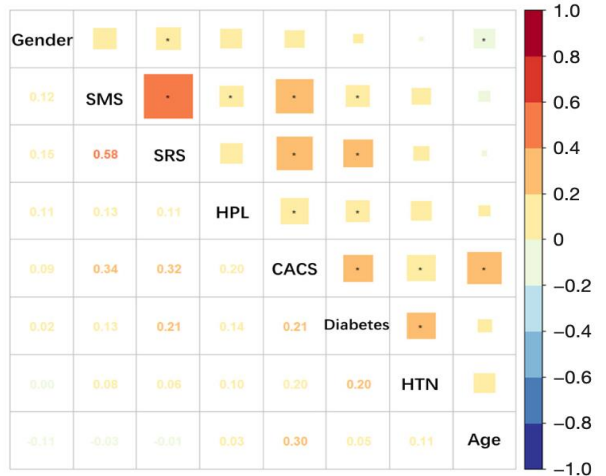


The p value difference at (A) the per-patient level and (B) the per-vessel level, single-photon emission computed tomography (SPECT)/coronary computed tomography angiography (CTA) versus positron emission tomography (PET)/coronary computed tomography angiography, positron emission tomography/coronary computed tomography angiography versus cardiac magnetic resonance (CMR)/coronary computed tomography angiography, and single-photon emission computed tomography/coronary computed tomography angiography versus cardiac magnetic resonance/coronary computed tomography angiography; all  $p > 0.05$ . Abbreviations as in Figure 3.

# PROSPETTIVE FUTURE



**Figure 6** Importance of features for different algorithms. (A) Importance of features for the random forest. (B) Importance of features for the XGBoost. (C) Importance of features for the Logistic. (D) Importance of features for the Rpart. SMS, summed motion score; CACS, coronary artery calcium score; SRS, summed rest score; XGBoost, extreme gradient boosting; Rpart, recursive partitioning and regression trees.



**Figure 3** Correlation heatmap of the features used. The numbers represent the Spearman correlation coefficients between the two features. SMS, summed motion score; SRS, summed rest score; HPL, hyperlipidemia; HTN, hypertension; CACS, coronary artery calcium score.

*GRAZIE*