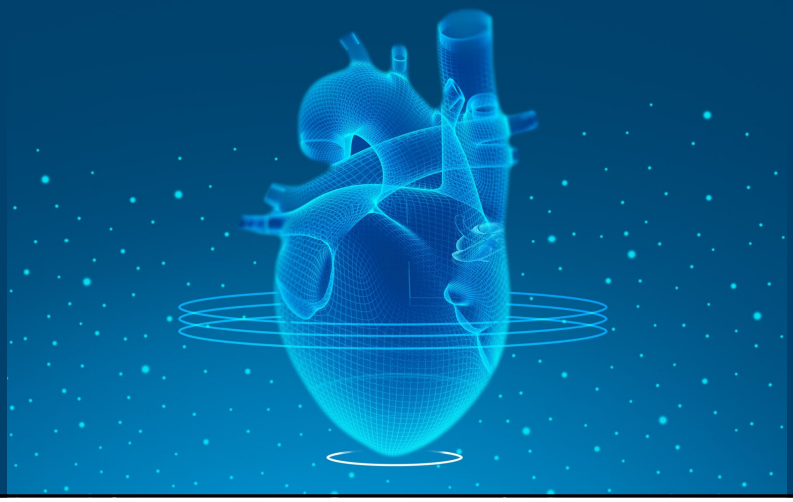
Minneapolis Heart Institute Foundation

GRAND ROUNDS



1

Women in Interventional Cardiology: A U.S. based Qualitative Research Study

Michaella Alexandrou, MD

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Disclosure of Relevant Financial Relationships

I, Michaella Alexandrou do not have any financial relationships to disclose.

Acknowledgments:

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3

Aren't there more important issues in interventional cardiology?

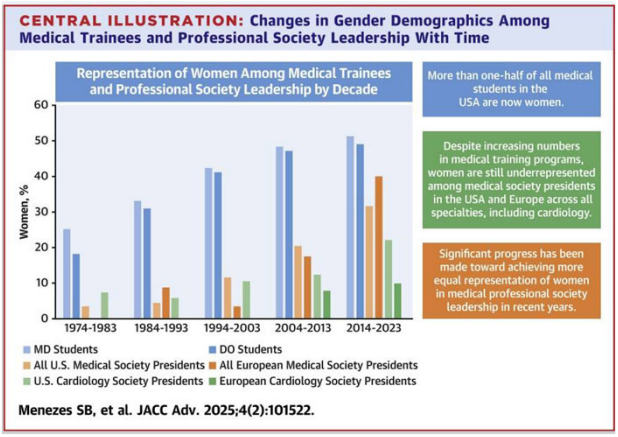
Isn't this just another 'diversity' presentation?

Are there still barriers in a specialty like cardiology?

4

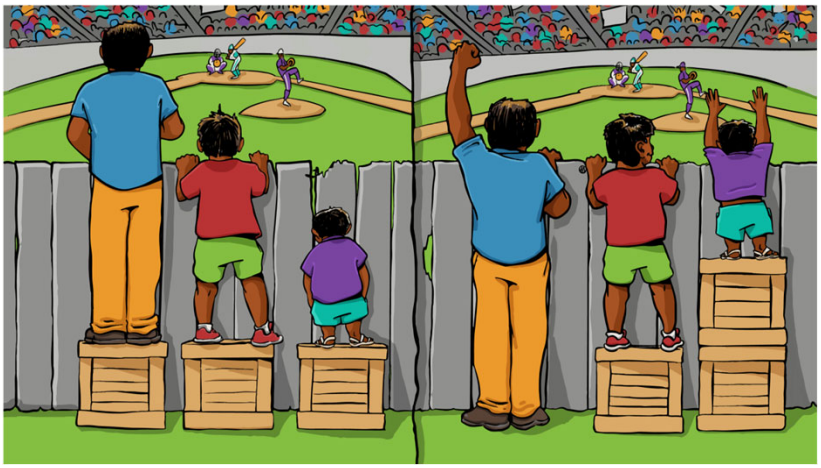
Representation

More women in medical schools, residency and fellowship programs, and even as faculty members.



Menezes SB, Shenton AN, Hays AG, Taub CC. Trends of Representation of Women in Professional Medical Societal Leadership in the United States and Europe. JACC Adv. 2025 Jan 9;4(2):101522. doi: 10.1016/j.jacadv.2024.101522. PMID: 39877669; PMCID: PMC11773233.

Equality vs Equity



Sex Differences in the Pursuit of Interventional Cardiology as a Subspecialty Among Cardiovascular Fellows-in-Training

Celina M. Yong, MD, MBA, MSc,[a,b] Freddy Abnousi, MD, MBA, MSc,[b,c] Anne K. Rzeszut, MA,[d] Pamela S. Douglas, MD,[e] Robert A. Harrington, MD,[b] Roxana Mehran, MD,[f] Cindy Grines, MD,[g] S. Elissa Altin, MD,[c] Claire S. Duvernoy, MD,[h] for the American College of Cardiology Women in Cardiology Leadership Council (ACC WIC) and the Society for Cardiovascular Angiography and Interventions Women in Innovations (SCAI WIN)

TABLE 3 Barriers to Choosing IC as a Subspecialty

	Factor Loading	Total (N = 314)	Men (n = 189)	Women (n = 124)	p Value
Work conditions					
Radiation exposure concerns during childbearing	0.82	3.0	1.0	4.0	0.001
Radiation exposure concerns for personal well-being	0.68	4.0	4.0	4.0	0.56
Sex discrimination or harassment	0.61	1.0	1.0	3.0	0.001
Wanting to have children in the next 5 yrs	0.60	4.0	3.0	4.0	0.14
Physically demanding nature of job	0.52	3.0	3.0	4.0	0.005
Culture					
You do not identify with other physicians in the specialty	0.73	3.0	3.0	3.0	0.97
"Old boys club" culture	0.73	2.0	1.0	3.0	0.001
Lack of encouragement from mentors	0.68	2.0	3.0	2.0	0.19
Lack of female role models	0.64	1.0	1.0	3.0	0.001
Job opportunities					
Poor likelihood of employment after completion of training	0.84	3.0	3.0	3.0	0.27
Little flexibility in job prospects/opportunities over lifetime	0.75	3.0	3.0	4.0	0.021
Overly competitive application process	0.71	2.0	2.0	2.0	1.00
Need to shorten training length in order to repay student loans	0.47	2.0	2.0	2.0	0.72
Schedule					
Uncontrollable or unpredictable lifestyle (on-call schedule)	0.80	5.0	5.0	4.0	0.88
Concern over long work hours/poor work/life balance	0.73	5.0	5.0	4.0	0.72
Did not want to extend years of training	0.67	3.0	3.0	3.0	0.24
Anticipated pressure on the job	0.47	3.0	3.0	3.0	0.62
Other interests					
Desire for different type of patient contact	0.83	4.0	4.0	4.0	0.49
Greater interest in another field	0.78	4.0	4.0	5.0	0.007
Technical difficulty	0.45	2.0	2.0	2.0	0.60

Values are median. Factor loadings are the correlation between the original variables and the factors; they are key to understanding the nature of a particular factor. Squared factor loadings indicate what percentage of the variance in an original variable is explained by the factor. Some respondents did not indicate sex in their survey response resulting in sex breakdown values that do not equal the total number of respondents.

IC = interventional cardiology.

Yong, C, Abnousi, F, Rzeszut, A. et al. Sex Differences in the Pursuit of Interventional Cardiology as a Subspecialty Among Cardiovascular Fellows-in-Training. *J Am Coll Cardiol Intv.* 2019 Feb, 12 (3) 219–228.

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JAHA
Journal of the American Heart Association

CURRENT ISSUE | ARCHIVE | JOURNAL IN

EDITORIAL | Originally Published 23 February 2021 | Check for updates

A Paucity of Female Interventional Cardiologists: What Are the Issues and How Can We Increase Recruitment and Retention of Women?

Cindy L. Grines, MD, Michele Voeltz, MD, Allison Dupont, MD, and Deepali Tukaye, MBBS, PhD the Society for Cardiovascular Angiography and Interventions Women in Innovations | AUTHOR INFO & AFFILIATIONS

Journal of the American Heart Association • Volume 10, Number 5 • https://doi.org/10.1161/JAHA.120.019431

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NEJM Journal Watch

GENERAL MEDICINE SPECIALTIES TOPICS VOICES CME GUIDELINE WATCH

SUMMARY AND COMMENT | CARDIOLOGY

INFORMING PRACTICE

August 9, 2024

Are Women Leaving Interventional Cardiology?

Table. Sample Size and Person Years of Follow-Up by Gender and Interventional Status Within Each Specialty[a]

	Interventionalists		Generalists		Total	
	Female	Male	Female	Male	Female	Male
Primary analysis						
Cardiology[b]						
No. (%)	344 (4.1)	8144 (95.9)	4027 (17.6)	18 853 (82.4)	4371 (13.9)	26 979 (86.1)
Person-years (%)	1208 (3.2)	37 048 (96.8)	18 767 (16.3)	96 309 (83.7)	19 975 (86.1)	133 357 (87.0)
Gastroenterology[c]						
No. (%)	219 (6.4)	3197 (93.6)	2524 (19.8)	10 201 (80.2)	2743 (17.0)	13 398 (83.0)
Person-years (%)	762 (6.3)	11 255 (93.7)	12 732 (18.4)	57 607 (81.5)	13 494 (16.6)	67 862 (83.4)
Sensitivity analysis[d]						
Cardiology						
No. (%)	144 (3.4)	4141 (96.6)	3191 (16.3)	16 418 (83.7)	3335 (14.0)	20 559 (86.0)
Person-years (%)	677 (2.8)	23 457 (97.2)	16 784 (15.6)	90 524 (84.4)	17.461 (13.3)	113 981 (86.7)
Gastroenterology						
No. (%)	81 (6.2)	1220 (93.8)	1881 (17.5)	8883 (82.5)	1962 (16.3)	10 103 (83.7)
Person-years (%)	424 (6.1)	6555 (93.9)	10 492 (16.7)	52 425 (83.3)	10 916 (15.6)	58 980 (84.4)

4.1% female interventionalists

Higher annual probability of becoming inactive for women interventionalists (21% vs. 15%)

Gualano SK, Henderson J, Menees S, Kerkar A, Parisi E, Kerr EA. Women's Representation in Interventional Cardiology. *JAMA Cardiol.* 2024;9(9):859–861. doi:10.1001/jamacardio.2024.1724

CENTRAL ILLUSTRATION: Women in Interventional Cardiology Practice in Australia

Gender distribution in the medical workforce:

- 42% of doctors are female
- 36% of specialists are female
- 15% of cardiologists are female
- 4.8% of interventional cardiologists are female
- 3.4% of cath lab directors are female
- 2% of TAVI accredited cardiologists are female
- 23% of doctors in the cardiology training program are female
- 9% of interventional cardiology fellows are female

89% of female interventional cardiologists operate at a site as the sole female interventional cardiologist

73% of public hospitals have no female interventional cardiologists

In Australia 3/8 states have no female interventional cardiologist

In Australia, on average, female cardiologists earn 55% of what male cardiologists earn

Burgess, S. et al. J Am Coll Cardiol. 2018;72(21):2663-7.

Burgess, S, Shaw, E, Ellenberger, K. et al. Women in Medicine: Addressing the Gender Gap in Interventional Cardiology. JACC. 2018 Nov, 72 (21) 2663–2667.

What is a Qualitative Study and Why Does It Matter?

Visible facts (numbers, statistics, measurable outcomes)

★ *Quantitative research*

Statistics tell us WHAT happens.

Qualitative studies help us understand WHY it happens and HOW people experience it.

Hidden aspects (beliefs, perceptions, experiences, barriers, motivations)

★ *Qualitative research*

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Study Design of WECARE

WomEn in interventional Cardiology: A qualitative REsearch study

Outcomes

Primary Outcome:

- Key challenges and barriers faced by women in IC.

Secondary Outcome:

- Support systems that assist women IC in their careers.

Procedures: Semi-structured interviews.

Population: Women U.S. based IC attendings/fellows.

Sample size: 18 participants

Sampling technique: Purposive and snowball technique.

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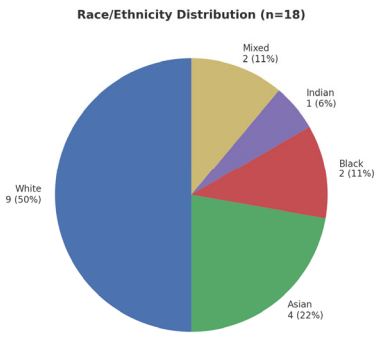
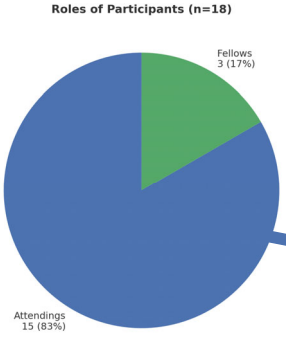
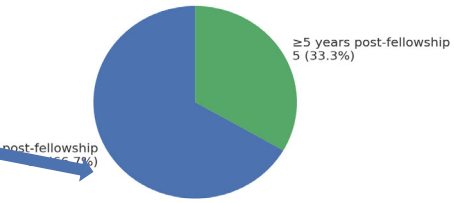
Participant Demographics (n=18)







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WE CARE

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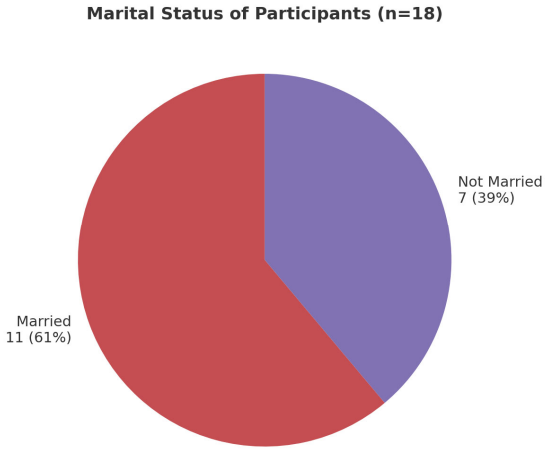

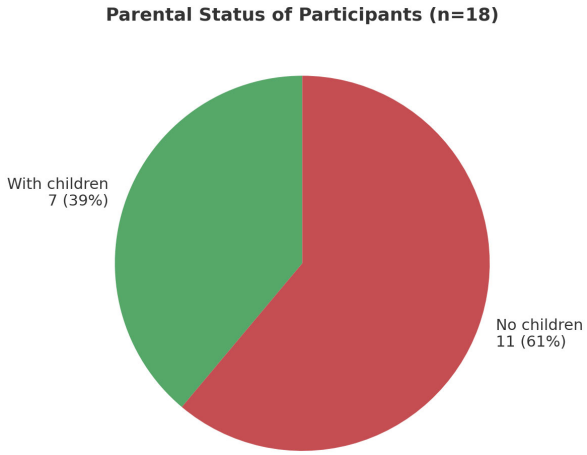

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Thematic Content Analysis

1. Career entry and negotiation
2. Motherhood and institutional gaps
3. Support systems
4. Bias and representation
5. Resilience and advocacy

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Career entry/opportunities

Variable experiences: from ***early discouragement*** to ***strong mentorship*** enabling advanced fellowships and leadership roles.

"People I looked up to told me this field's not meant for a little white girl like myself"

Early Discouragement

"People assume I don't do procedures alone"

Competence doubt

"One of my mentors tried to persuade me to do something else, said it's not a good lifestyle for a woman, but another mentor was very supportive"

Protective bias & Conflicting Mentorship

"My boss advocated for me to be Cath lab director… I learned to advocate for myself"

Mentorship & Self-Advocacy

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Negotiation

Negotiating salaries was often described as opaque or inequitable, requiring self-advocacy or institutional escalation.

"Salary transparency change ***showed I was underpaid****"*

*"****Negotiated*** *0.8 FTE when pregnant despite contract saying 1.0"*

Key Takeaways

- Talk with other women ICs
- Communicate your needs
- Ask specific questions
- Speak about pregnancy & parental leave
- Request transparency

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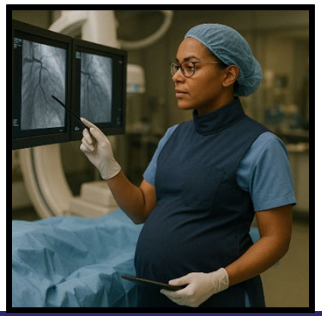
Motherhood

- Complex decisions about pregnancy timing
- Limited maternity leave during training
- Breastfeeding challenges

→ requiring improvisation or advocacy

"[..] had no maternity leave policy, forced them to pay 10 weeks by presenting options … also ***negotiated reduced hours … pregnancies carefully timed*** *to training schedules"*



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Radiation Safety

*"Zero concerns… **mentors discussed data with us**… frustrating to hear men tell women it's unsafe when there's no evidence"*

*"I know the data says it's probably okay but **avoided the lab during pregnancy**, I was on research"*

*"**Worried during first pregnancy**, double-leaded despite discomfort. **Less cautious by third child due to growing evidence** of safety"*

Inconsistent institutional policies

From: anxiety despite reassuring data To: no worries

Delayed dosimetry results during pregnancy limit real-time reassurance

Representation

Some reported exclusion from informal decision-making networks and limited leadership opportunities despite qualifications, citing persistent "old boys' club" cultures.

*"When I was the only female fellow I definitely felt left out… **activities I wasn't included in**"*

*"Leadership opportunities tend **to be given to people in the club**"*

Formal Networks VS **Informal Networks**

Bias

Common initial **assumptions** by staff or patients that they were nurses, **but** often described it as manageable or surmountable → personal strategies & institutional allies to minimize its impact.

Bias	Strategy
"I had clinic **staff tell patients that I'm a female doctor that does just diagnostic** *Cath - no stents"*	*"I had to* **EDUCATE** *them"*
"Sometimes the nurses treat me differently at first - they ***assume I'm a nurse or assistant****"*	*"But after I* **INTRODUCE MYSELF AS DOCTOR** *they treat me the same"*
"Some patients **question my training or my capabilities** *based on how I look or how I talk"*	*"I tell them I'm qualified...* **IT'S UP TO YOU IF YOU WANT ME** *to do it"*

Support systems

Positive mentorship, both male and female

Family support

Childcare arrangements

Peer networks

Resilience and advocacy

Strong *professional* ***commitment*** *and* ***satisfaction***

No regret regarding the choice of IC

Strategies for overcoming obstacles:

Clear communication with patients	***Boundary-setting for work-life integration***	***Advocacy for policy change***

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Being the first woman IC in a cath lab





"I feel like I'm often the first one to find out about a lot of stuff..."

Own your place	**Embrace your role, you know who you are**
Build allies	**If you are not at the table, you are on the menu**
Advocate | Set new norms	**Express your needs & teach others how to meet them**

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Practical Steps Forward

Institutional level

- Standardize **parental leave** and **radiation safety** policies across programs
- Ensure **transparent compensation and FTE structures**
- Build formal **mentorship and sponsorship pathways** for women ICs

Leadership level

- Include women ICs on **key decision-making committees**
- Offer **negotiation and leadership training** as part of career development
- Normalize discussions about **family planning and flexibility**

Community level

- Strengthen **peer networks** for support and information-sharing
- Highlight **women role models** through visibility initiatives and conferences
- Encourage **male allyship** - engage leaders to advocate for equity

Limitations

- Small, non-random sample (but purposive for depth)
- Self-reported bias
- US-based context

Take-home Message

Women ICs report: **High professional satisfaction**

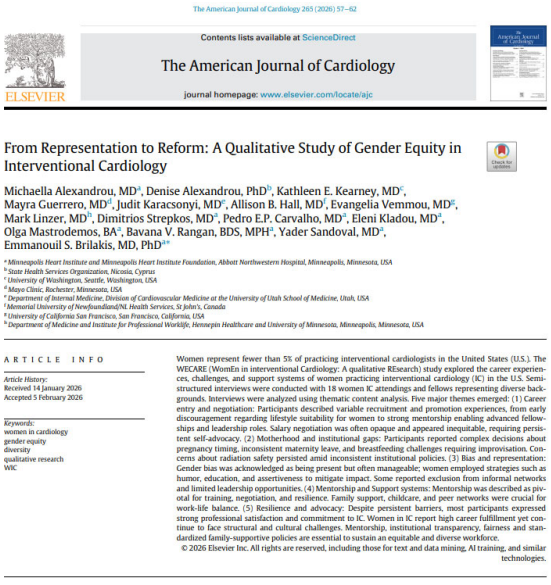
But: **Ongoing challenges**

- Negotiation
- Work-life balance
- Occasional bias

Keys to sustaining a diverse and equitable workforce:

★ Mentorship ★ Institutional support ★ Personal advocacy

Just got published!



The American Journal of Cardiology 265 (2026) 57–62

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journal homepage: www.elsevier.com/locate/ajc

From Representation to Reform: A Qualitative Study of Gender Equity in Interventional Cardiology

Michaella Alexandrou, MD[a], Denise Alexandrou, PhD[b], Kathleen E. Kearney, MD[c], Mayra Guerrero, MD[d], Judit Karacsonyi, MD[e], Allison B. Hall, MD[f], Evangelia Vemmou, MD[g], Mark Linzer, MD[h], Dimitrios Strepkos, MD[a], Pedro E.P. Carvalho, MD[a], Eleni Kladou, MD[a], Olga Mastrodemos, BA[a], Bavana V. Rangan, BDS, MPH[a], Yader Sandoval, MD[a], Emmanouil S. Brilakis, MD, PhD[a,*]

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[f] Memorial University of Newfoundland/NL Health Services, St John's, Canada
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gender equity
diversity
qualitative research
WIC

Women represent fewer than 5% of practicing interventional cardiologists in the United States (U.S.). The WECARE (WomEn in interventional Cardiology: A qualitative REsearch) study explored the career experiences, challenges, and support systems of women practicing interventional cardiology (IC) in the U.S. Semi-structured interviews were conducted with 18 women IC attendings and fellows representing diverse backgrounds. Interviews were analyzed using thematic content analysis. Five major themes emerged: (1) Career entry and negotiation: Participants described variable recruitment and promotion experiences, from early discouragement regarding lifestyle suitability for women to strong mentorship enabling advanced fellowships and leadership roles. Salary negotiation was often opaque and appeared inequitable, requiring persistent self-advocacy. (2) Motherhood and institutional gaps: Participants reported complex decisions about pregnancy timing, inconsistent maternity leave, and breastfeeding challenges requiring improvisation. Concerns about radiation safety persisted amid inconsistent institutional policies. (3) Bias and representation: Gender bias was acknowledged as being present but often manageable; women employed strategies such as humor, education, and assertiveness to mitigate impact. Some reported exclusion from informal networks and limited leadership opportunities. (4) Mentorship and Support systems: Mentorship was described as pivotal for training, negotiation, and resilience. Family support, childcare, and peer networks were crucial for work-life balance. (5) Resilience and advocacy: Despite persistent barriers, most participants expressed strong professional satisfaction and commitment to IC. Women in IC report high career fulfillment yet continue to face structural and cultural challenges. Mentorship, institutional transparency, fairness and standardized family-supportive policies are essential to sustain an equitable and diverse workforce.

See you at ACC!

@CCAD_MHIF

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First month (2023)

Next steps!

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THANK YOU!

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Creating a world without heart and vascular disease
Minneapolis Heart Institute
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Abbott Northwestern Hospital

Alexandrou M., Alexandrou D., Guerrero M., Rangan B.V., Kearney K., Mastrodemos O., Jalli S., Karacsonyi J., Strepkos D., Mutlu D., Carvalho P., Hall A.B., Kladou E., Williford N., Ser O.S., Sandoval Y., Brilakis E.S.

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AngioWave Artificial intelligence assisted analysis of septal collaterals for retrograde chronic total occlusion percutaneous coronary intervention

Dimitrios Strepkos, MD
Center for Coronary Artery Disease
International Research Scholar

PI: Emmanouil S. Brilakis, MD, PhD

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Disclosures

I, Dimitrios Strepkos, **DO NOT** have any relevant financial relationships to disclose.

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The authors are grateful for the philanthropic support of our generous Anonymous donors(2), and the philanthropic support of Drs. Mary Ann and Donald A Sens; Mr. Raymond Ames and Ms. Barbara Thorndike; Frank J and Eleanor A. Maslowski Charitable Trust; Joseph F and Mary M Fleischhacker Family Foundation; Mrs. Diane and Dr. Cline Hickok; Mrs. Marilyn and Mr. William Ryerse; Mr. Greg and Mrs. Rhoda Olsen; Mrs. Wilma and Mr. Dale Johnson; Mrs. Charlotte and Mr. Jerry Golinvaux Family Fund; the Roehl Family Foundation; the Joseph Durda Foundation.

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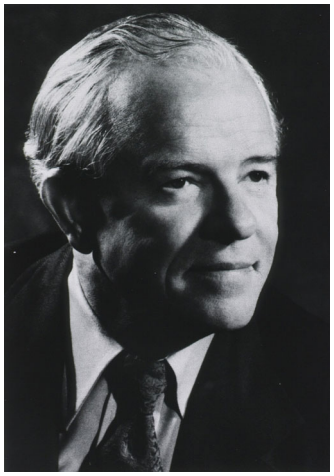
First Coronary Angiogram

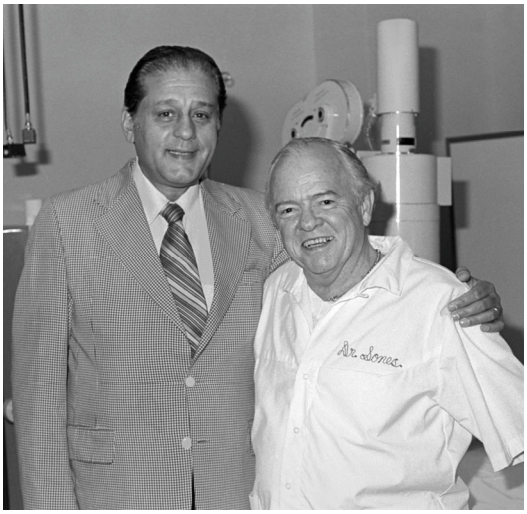


Dr F. Mason Sones, Jr
1918-1985

Internship: Baltimore University Hospital, Baltimore, MD

Residency: Henry Ford Hospital, Detroit, MI

Position: Head of Pediatric Cardiology, Cleveland Clinic, Cleveland, OH



Sones with René Favaloro at the Cleveland Clinic

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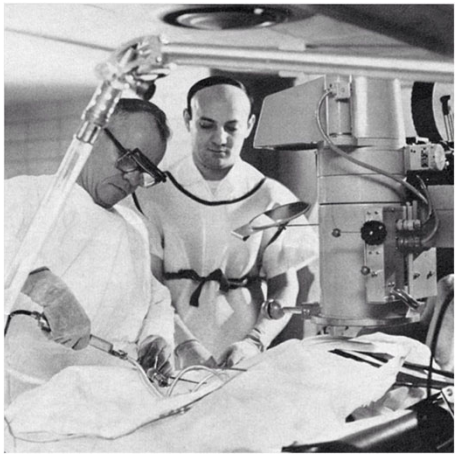
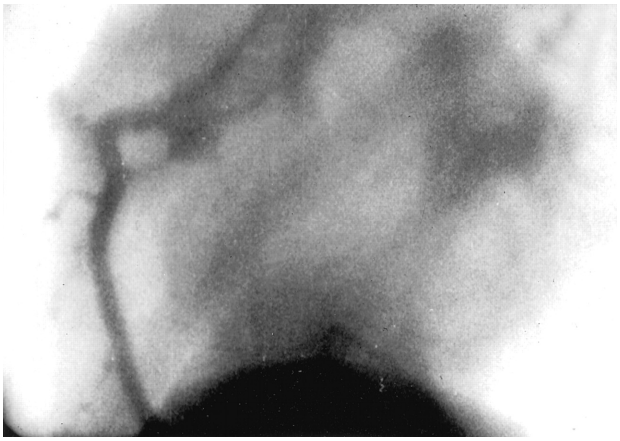
First Coronary Angiogram



October 30, 1958



Cheng TO. First selective coronary arteriogram. *Circulation*. 2003;107(5):E42–E42. doi:10.1161/01.CIR.0000053958.38681.81

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Evolution of CTO PCI

First PCI: 1977 by Andreas Gruentzig in Switzerland

CTO PCI: Early 1990s (high-stiffness guidewires are developed), Dr. Suzuki, Dr. Tamai, and Dr. Katoh, Japan

Catheterization and Cardiovascular Diagnosis

Original Study

Retrograde coronary angioplasty of isolated arterial segments through saphenous vein bypass grafts

Joel K. Kahn MD, Geoffrey O. Hartzler MD

First published: June 1990 | https://doi.org/10.1002/ccd.1810200205 | VIEW METRICS

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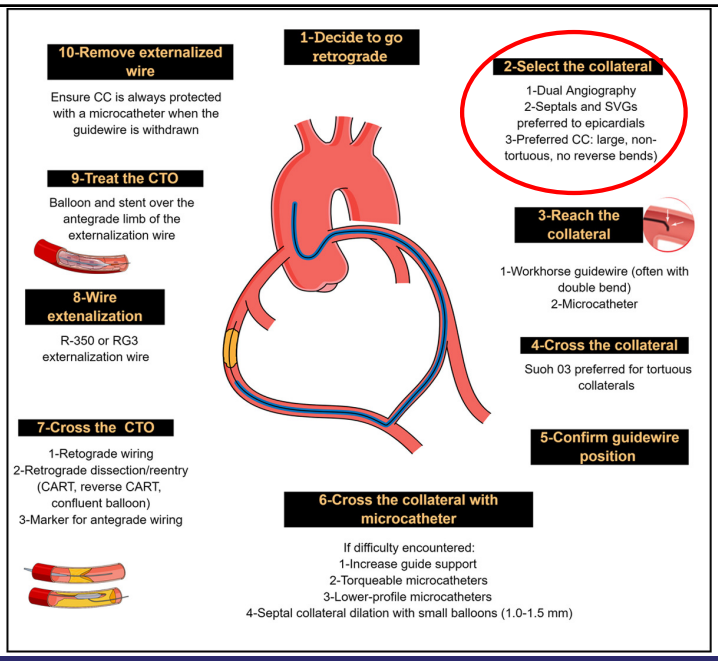
The Steps of Retrograde Chronic Total Occlusion (CTO) Percutaneous Coronary Intervention (PCI)



Megaly M, Xenogiannis I, Abi Rafeh N et al. Retrograde Approach to Chronic Total Occlusion Percutaneous Coronary Intervention. 2020;13:e008900.

Septal Collaterals In Retrograde CTO PCI

Bypass > Septal > Epicardial

↓

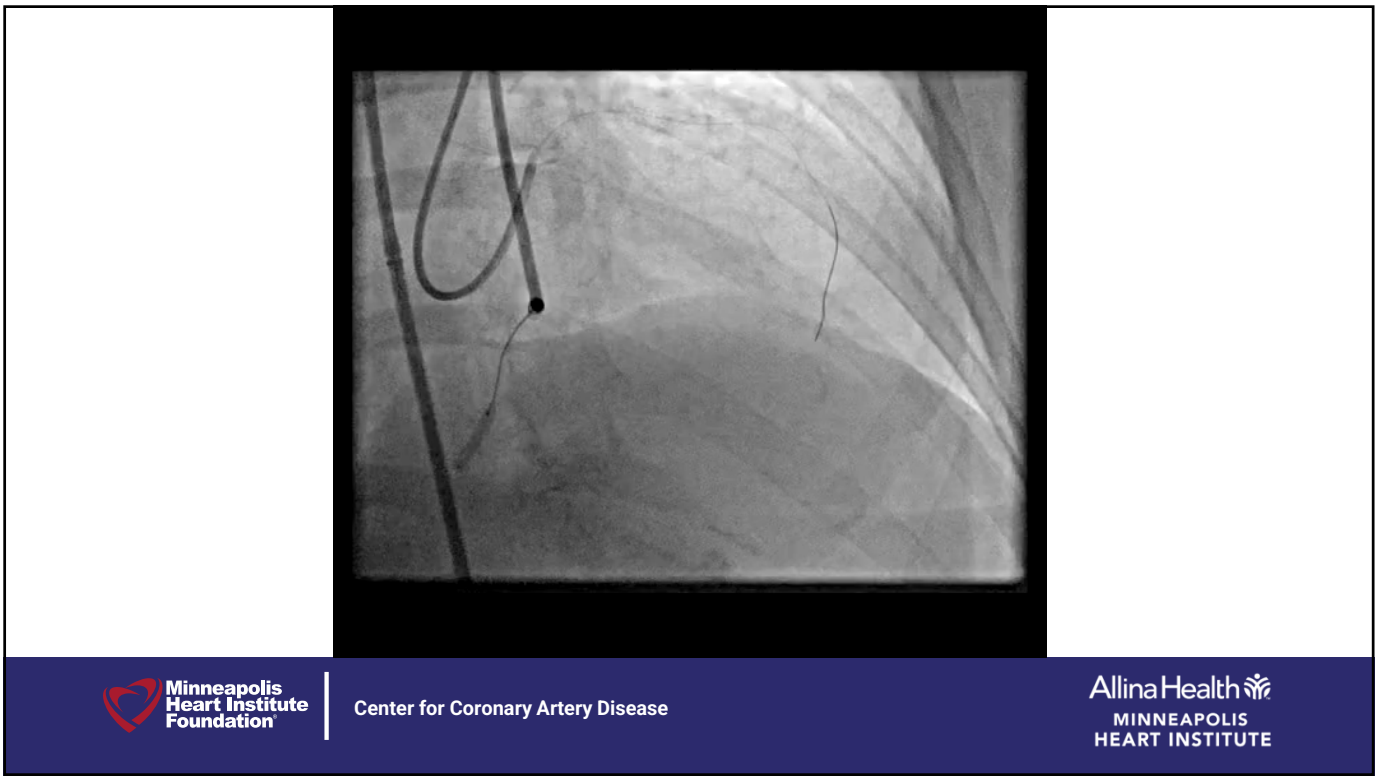
50-65% of collateral channels

↓

Careful Selection of Septal Collateral

Small size, hard to visualize

Megaly M, Xenogiannis I, Abi Rafeh N et al. Retrograde Approach to Chronic Total Occlusion Percutaneous Coronary Intervention. 2020;13:e008900.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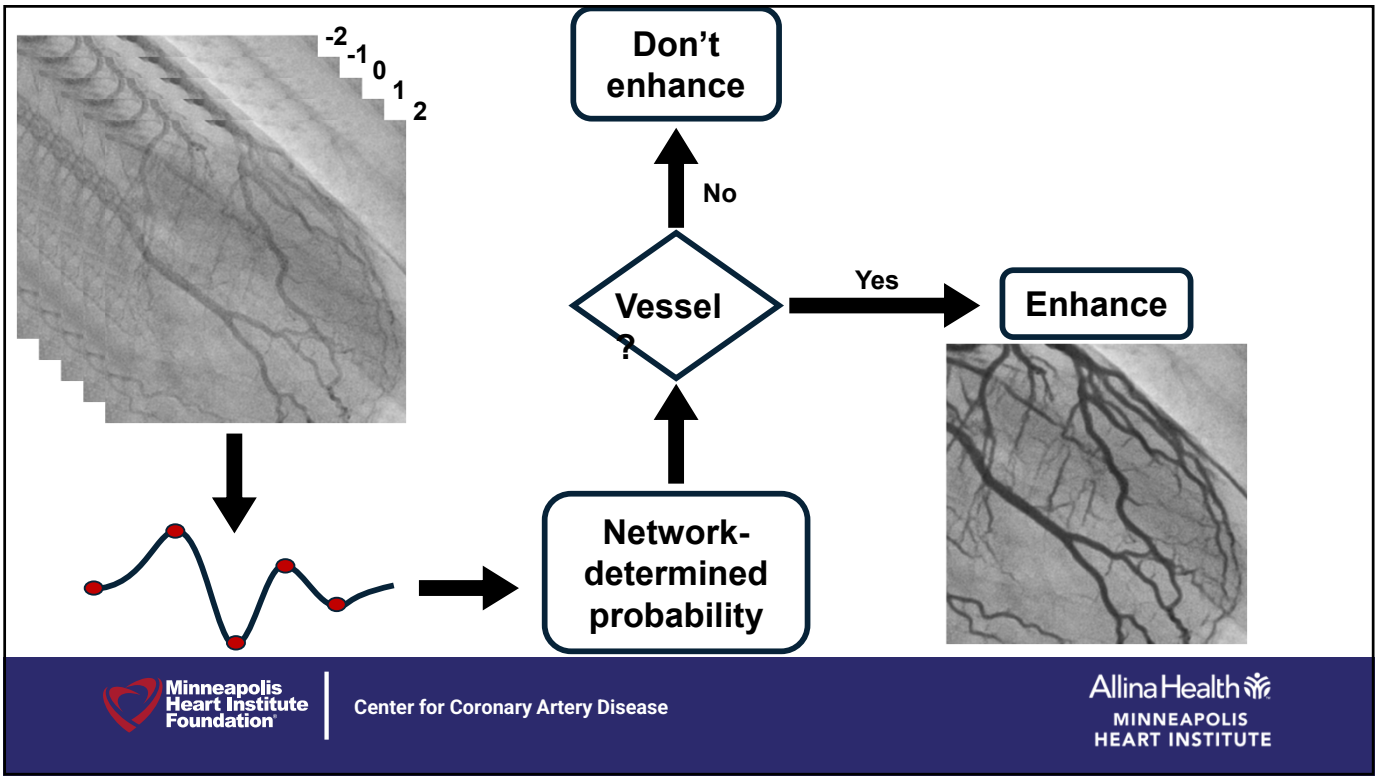
-2
-1
0
1
2
Don't enhance
No
Vessel ?
Yes
Enhance
Network-determined probability
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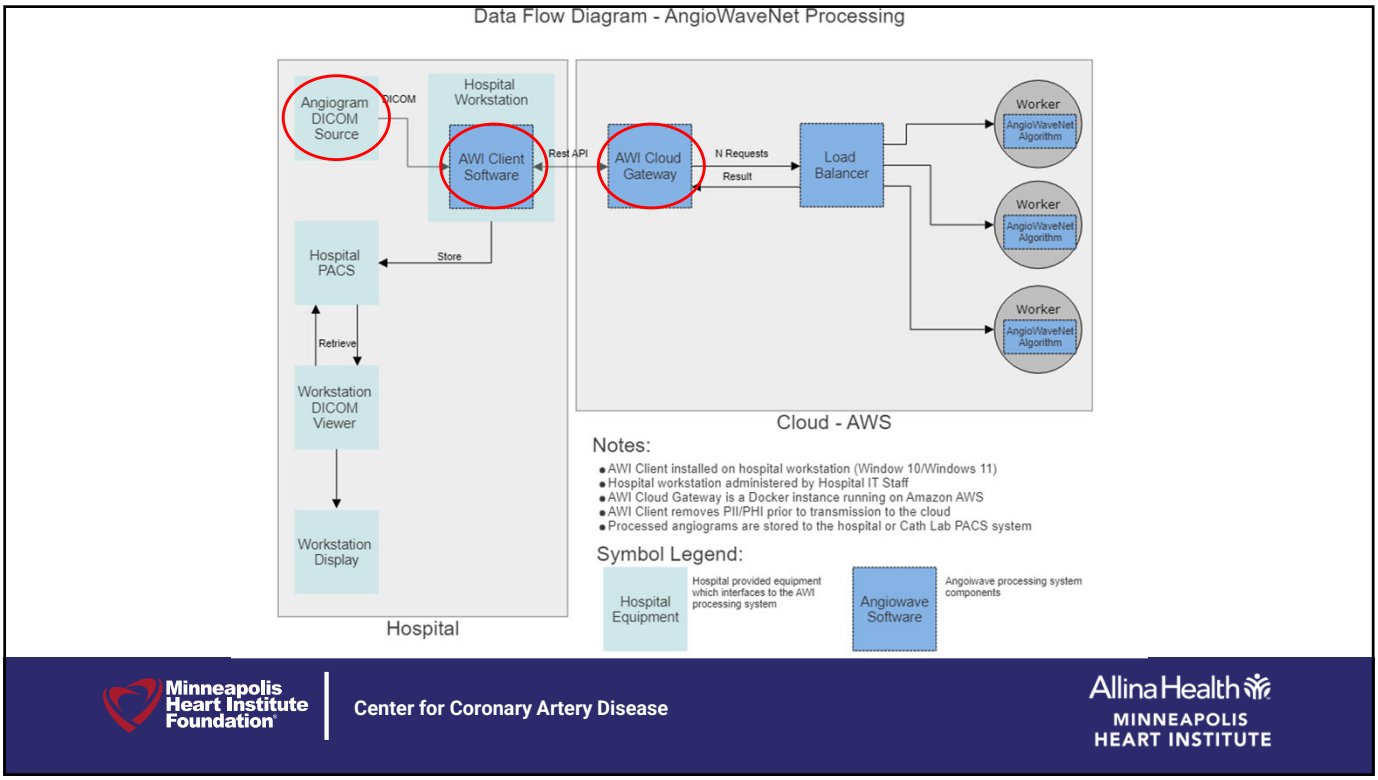

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Aims of the Current Study

1. Assess reader's interpretation of septal collateral size, morphology and complexity
2. Compare the performance on predicting septal crossing
3. Compare overall ease of interpretation of non-enhanced versus AI-enhanced angiograms using AngioWave (AngioWave, Concord, MA)

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Study Design and Population

- 50 patients who had an attempt for retrograde crossing through a septal collateral
- 2 independent readers

Study subject profile:

- 63-year-old
- obese
- male
- multiple comorbidities
- presents with stable angina

Variables	Overall (n = 50)
Age (years)	62.52 ± 9.57
Gender, male	68.0% (34)
Body mass index (kg/m2)	32.36 ± 6.63
Diabetes mellitus	32.0% (16)
Hypertension	76.0% (38)
Dyslipidemia	90.0% (45)
Smoking, current	16.0% (8)
Left ventricular ejection fraction (%)	53.47 ± 13.09
Heart failure	24.0% (12)
Prior PCI	54.0% (27)
Prior MI	34.0% (17)
Prior CABG	20.0% (10)
Cerebrovascular disease	12.0% (6)
CAD presentation	
Stable angina	76.0% (38)
Unstable angina	14.0% (7)
NSTEMI	6.0% (3)
STEMI	0.0% (0)
No symptoms	4.0% (2)
Nonischemic symptoms	0.0% (0)

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Angiographic Characteristics

Variables	Overall (n = 50)
CTO target vessel	
Right coronary artery	83.7% (41)
Left anterior descending	14.3% (7)
Left circumflex	2.0% (1)
Left main	0.0% (0)
Other	0.0% (0)
Interventional collaterals	95.7% (45)
Lesion diameter (mm)	3.11 ± 0.32
Lesion length (mm)	35.00 ± 22.27
Proximal cap ambiguity	55.3% (26)
Side branch at the proximal cap	76.6% (36)
Blunt/no stump	79.2% (38)
Moderate/severe calcification	50.0% (24)
Moderate/severe proximal tortuosity	16.7% (8)
In-stent restenosis	2.2% (1)
J-CTO score	2.96 ± 0.93
CASTLE score	2.23 ± 1.10
PROGRESS-CTO score	0.83 ± 0.64

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Procedural Characteristics

Variables	Overall (n = 50)
First crossing strategy	
Antegrade wiring	56.0% (28)
Antegrade dissection and re-entry	0.0% (0)
Retrograde wiring	44.0% (22)
Successful crossing strategy	
Antegrade wiring	4.0% (2)
Antegrade dissection and re-entry	8.0% (4)
Retrograde wiring	74.0% (37)
None	14.0% (7)
Balloon uncrossable CTO lesion	11.1% (5)
Balloon undilatable CTO lesion	7.3% (3)
Number of stents	2.81 ± 1.05
Procedure time (minutes)	183.00 [143.00, 245.00]
Contrast volume (mL)	225.00 [196.25, 263.75]
Fluoroscopy time (minutes)	54.00 [39.00, 81.10]

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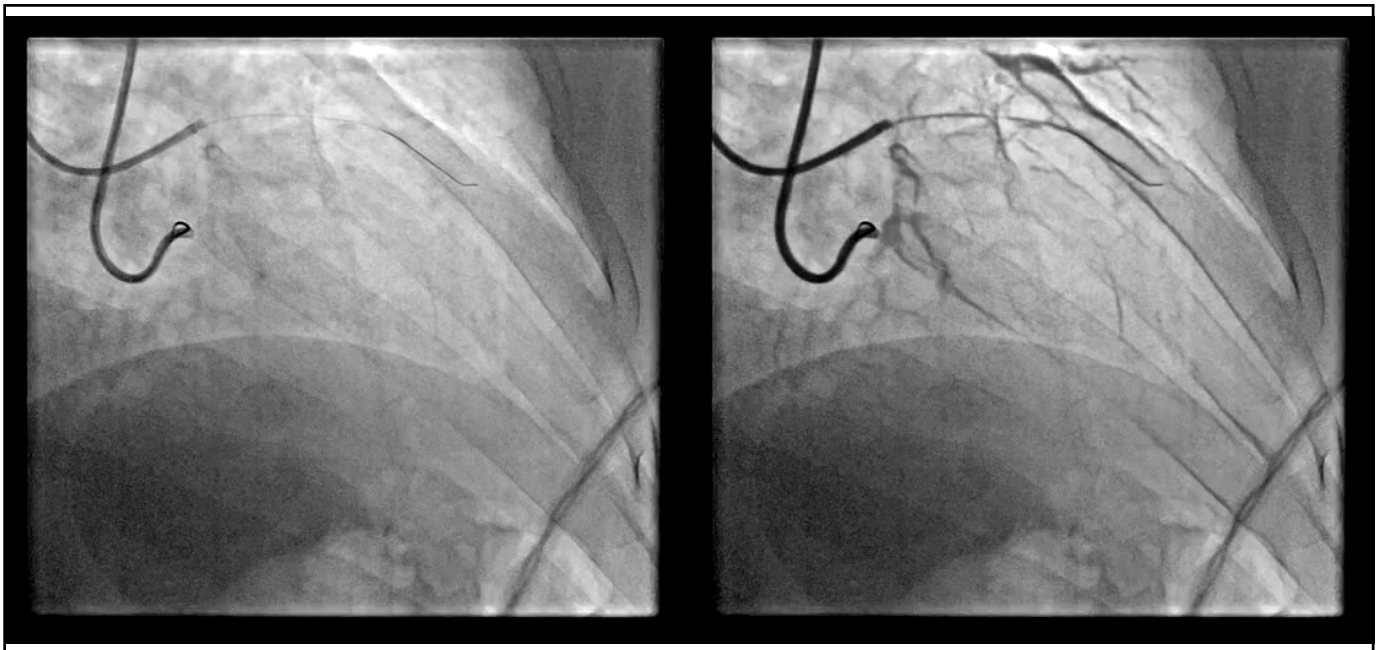

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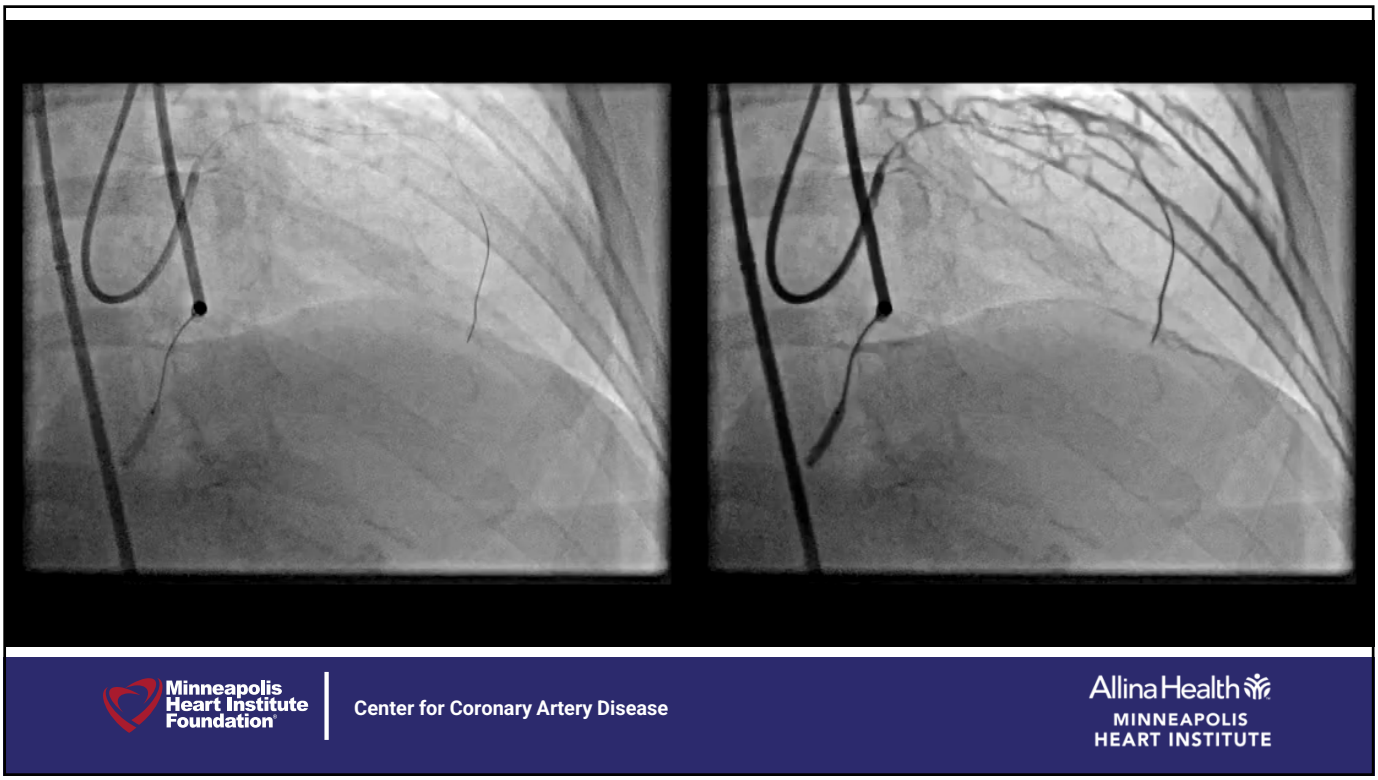
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Septal Collateral Crossing Predictive performance

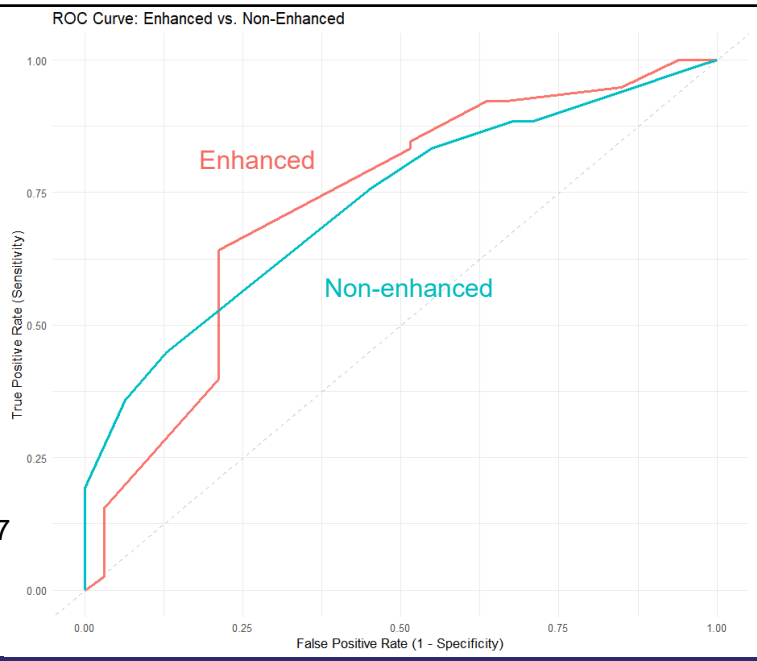
- $AUC_{AI\text{-}enhanced} = 0.74$
- $AUC_{standard} = 0.73$
- De Long test: p=0.856

Wilcoxon Signed-Rank Test

- p<0.001
- Mean difference = +10.7%

Inter-operator agreement:

- $ICC_{AI\text{-}enhanced} = 0.204$, p=0.007
  $-0.068 < ICC_{AI\text{-}enhanced} < 0.45$
- $ICC_{standard} = -0.018$, p=0.58
  $-0.172 < ICC_{standard} < 0.174$



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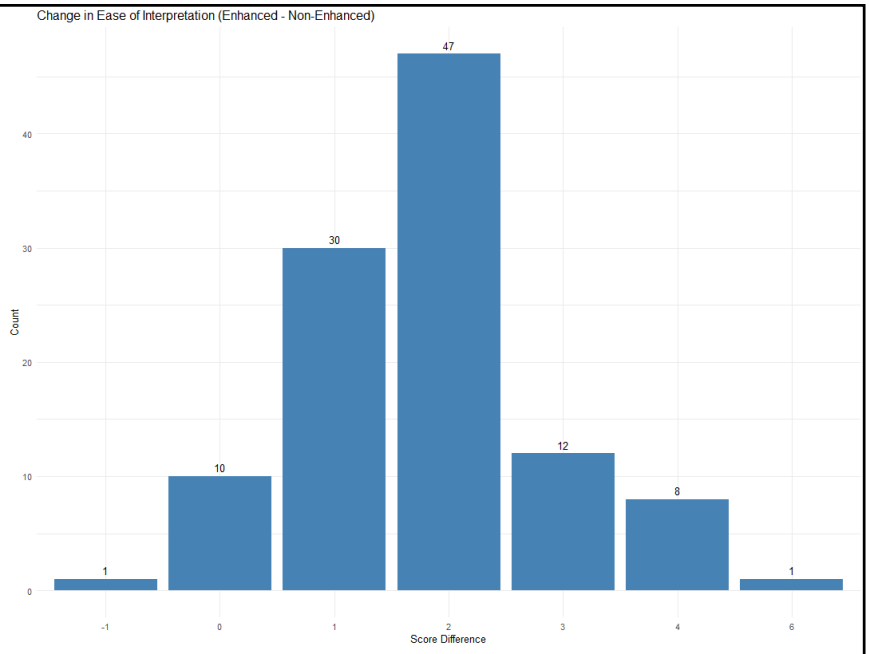
Ease of Interpretation

Ranked by 1 (lowest) to 10 (highest)

9.00 vs 7.00,
p<0.001
Wilcoxon Signed-Rank
Test: Aggregate p<0.001



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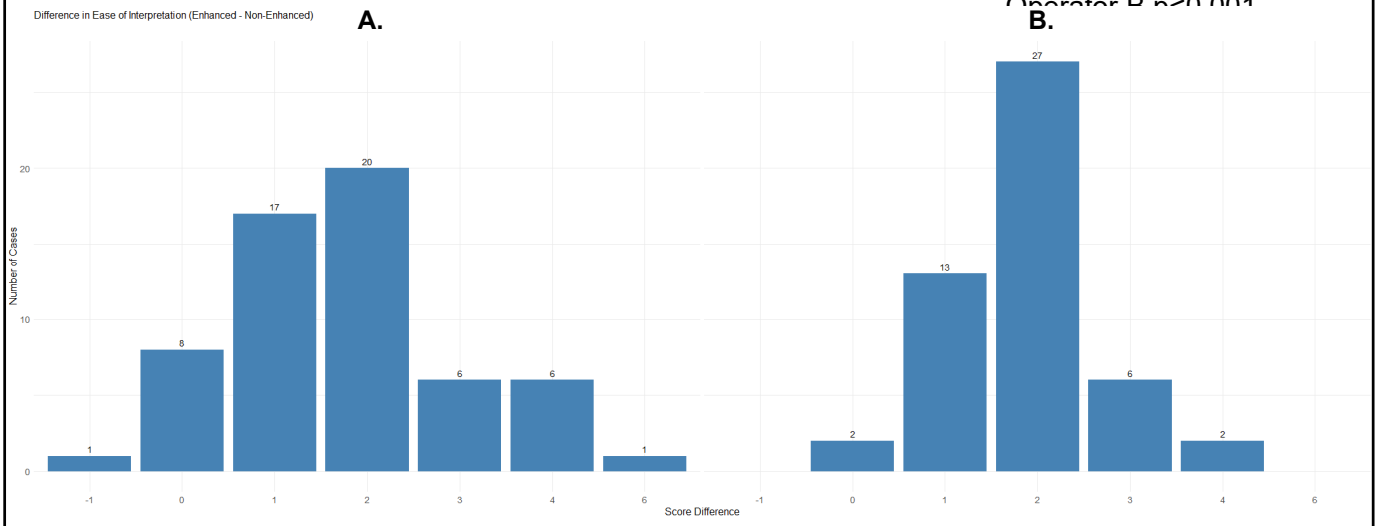
Ease of Interpretation

Wilcoxon Signed-Rank Test:
Operator A p<0.001
Operator B p<0.001



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Septal Collateral Morphology

Variables	Non-enhanced (n = 108)	Enhanced (n = 108)	p-value
J-channel score			0.007
0	58.5% (62)	77.8% (84)	
1	37.7% (40)	19.4% (21)	
2	3.8% (4)	2.8% (3)	
Predicted Likelihood of Crossing	70.00 (65.00, 80.00)	85.00 (78.75, 90.00)	<0.001
Ease of Interpretation	7.00 (6.00, 8.00)	9.00 (8.00, 10.00)	<0.001
Werner Score			0.007
CC0	26.2% (28)	16.8% (18)	
CC1	73.8% (79)	76.6% (82)	
CC2	0.0% (0)	6.5% (7)	
Reverse Bend	9.3% (10)	5.6% (6)	0.3
Continuous Bends	15.0% (16)	9.3% (10)	0.2
Corkscrew Bends	20.6% (22)	10.2% (11)	0.035
Septal Collateral Tortuosity	51.5% (53)	31.7% (33)	0.004

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Limitations

1. Retrospective study with all the inherent limitations
2. Cases performed by experienced operators, which may limit the external validity of our results
3. Inter-operator agreement in subjective variables was low
4. Sample size was low

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Conclusions

- Compared with standard angiograms, AngioWave-enhanced angiograms have similar predictive performance
- AngioWave-enhanced angiograms allow for easier interpretation but show lower collateral complexity

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AngioWave Artificial Intelligence-Assisted Analysis of Septal Collaterals for Retrograde Chronic Total Occlusion Percutaneous Coronary Intervention

Dimitrios Strepkos, MD · Sandeep Jalli, DO · Michaella Alexandrou, MD · ... · Konstantinos Voudris, MD, PhD · Yader Sandoval, MD · Emmanouil S. Brilakis, MD, PhD ... Show more

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Show Outline

Abstract

Artificial intelligence (AI) can augment coronary angiography images to enhance interpretation. We compared two blinded operators' interpretation of chronic total occlusion (CTO) angiograms obtained for retrograde percutaneous coronary intervention (PCI) standard vs. AI-enhanced (AngioWave, Concord, MA) images and assessed the association with septal collateral crossing success. We reviewed 50 retrograde CTO PCI angiograms. The most common (83.7%) target vessel was the right coronary artery and target CTOs had high complexity with high rates of proximal cap ambiguity (55.3%), blunt or no stump (79.2%), moderate or severe calcification (50.0%) and high J-CTO scores (2.96 ± 0.93). Retrograde was the first crossing strategy in 44.0% of lesions and was successful in 80%. Operators assigned lower frequency of corkscrew bends (10.2% vs 20.6%, p=0.035) and septal collateral tortuosity (31.7% vs 51.5%, p=0.004) and higher frequency of CC2 collateral size (6.5% vs 0.0%, p=0.007) to AI-enhanced compared with standard angiograms. The aggregate predicted likelihood of crossing (85% vs 70%, p<0.001, Wilcoxon test: p<0.001) and ease of interpretation (9.00 vs 7.00, p<0.001) were higher in the AI-enhanced angiograms. There was no difference in predictive performance for crossing success in the two groups (AUCAI-enhanced = 0.74 and AUCstandard = 0.73, De Long test: p=0.856). AI-enhanced angiograms were assigned a median 10.7% higher predicted likelihood of success. Compared with standard angiograms, AI-enhanced angiograms allow easier interpretation of angiograms and have similar predictive performance for collateral crossing despite showing lower collateral complexity.

Keywords

chronic total occlusion · percutaneous coronary intervention · retrograde wiring · septal collaterals

The American Journal of Cardiology

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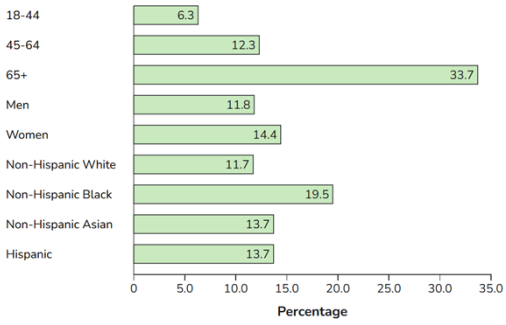
Future Perspectives

Percentage of US Adults Aged 18 Years and Older With CKD,* by Age, Sex, and Race/Ethnicity



*CKD stages 1–4 using data from the 2017–March 2020 National Health and Nutrition Examination Survey based on 2021 CKD Epidemiology Collaboration GFR estimating equation, including serum creatinine, age, and sex. For more details on methods, see "How Estimates Were Calculated."

Minimize Contrast Volume

Adequate Hydration

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Future Perspectives

The ALARA Principle

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Future Perspectives

AngioWave-Enhanced Angiography to Reduce Contrast and Radiation Utilization in Coronary Angiography and Percutaneous Coronary Intervention (AWARE-PCI)

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