Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Journal of Cardiovascular Computed Tomography 14 (2020) 466–470

Contents lists available at ScienceDirect

Journal of Cardiovascular Computed Tomography

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

Opinion paper

Highlights of the 15th annual scientific meeting of the Society of Cardiovascular Computed Tomography

Jonathan R. Weir-McCall [a], Kelley Branch [c], Maros Ferencik [d], Ron Blankstein [e], Andrew D. Choi [f], Brian B. Ghoshhajra [g], Kavitha Chinnaiyan [h], Purvi Parwani [i], Edward Nicol [b,*], Koen Nieman [j]

[a] School of Clinical Medicine, University of Cambridge, Cambridge, UK
[b] Department of Cardiology, Royal Brompton and Harefield NHS FT, London, UK
[c] University of Washington Heart Institute, Seattle, WA, USA
[d] Knight Cardiovascular Institute, Oregon Health & Science University, Portland, OR, USA
[e] Cardiovascular Imaging Program, Departments of Medicine and Radiology, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA
[f] Division of Cardiology and Department of Radiology, The George Washington University School of Medicine, Washington, DC, USA
[g] Division of Cardiovascular Imaging, Massachusetts General Hospital, Harvard Medical School, 55 Fruit St, Boston, MA, USA
[h] Department of Cardiology, William Beaumont Hospital, Royal Oak, MI, USA
[i] Division of Cardiology, Department of Medicine, Loma Linda University Health, Loma Linda, CA, USA
[j] Stanford University School of Medicine, Cardiovascular Institute, Stanford, CA, USA

ARTICLE INFO

Keywords:
Coronary CTA
Computational flow dynamics
Atherosclerosis
Congenital heart disease
Cardiac computed tomography

ABSTRACT

The 15th Society of Cardiovascular Computed Tomography (SCCT) annual scientific meeting (ASM) welcomed 770 digital attendees from 44 countries, over 2 days, with a program that included 30 sessions across three simultaneously streaming channels, 10 exhibitors and a diverse range of scientific abstracts. In addition, #SCCT2020 generated >5900 tweets from nearly 700 engaged social media participants resulting in an estimated 38 million digital impressions and becoming #1 trending medical meeting in social media in the world during the meeting time period. This article summarizes the many themes and topics of presentation and discussion in this meeting, and the many technical advances that are likely to impact future clinical practice in cardiovascular computed tomography.

1. Introduction

1.1. "Improvise, adapt, overcome"

This year, more than seven hundred people woke up on the morning of the July the 17th, 2020 ready and eager to join the 15th annual scientific meeting (ASM) of the Society of Cardiovascular Computed Tomography (SCCT). In previous years, the pre-meeting morning ritual would have involved donning suits and skirts, polishing shoes, and coiffing hair, all to create a look as sharp as the mind contained within. This year however was different, for it was the year that Corona Virus Related Disease 2019 (COVID-19) became a global pandemic and scuppered usual plans. At the time of the meeting the world had seen 13.6 million cases of COVID-19 with the rate of new cases showing no signs of slowing. The need to change fundamental daily behaviors, practices, and social conventions has affected everyone across the globe, with local and international travel restrictions resulting in the cancellation of swathes of medical meetings and conferences. On this backdrop, the leadership of the SCCT, led by Dr.'s Blankstein and Nieman, decided to transition to a virtual SCCT ASM. With just 2 months to prepare, plan, and execute, the organizing committee and SCCT staff had a significant challenge to overcome, but one to which they rose with aplomb. From this crucible of connectivity, a fully virtual meeting was drafted, refined, and brought to successful fruition (see Fig. 1).

Over 2 days, the 15th Society of Cardiovascular Computed Tomography (SCCT) annual scientific meeting (ASM) welcomed 770 digital attendees from 44 countries with a program that included 30 sessions across three simultaneously streaming channels, 10 exhibitors, and a diverse range of >200 scientific abstracts.

The evolving needs of the SCCT community and the virtual format of

* Corresponding author. Imperial College London School of Medicine, Department of Cardiology, Royal Brompton and Harefield NHS FT, London, SW3 6NP, UK.
E-mail address: e.nicol@nhs.net (E. Nicol).

https://doi.org/10.1016/j.jcct.2020.09.008
Received 27 August 2020; Accepted 28 September 2020
Available online 1 October 2020

Fig. 1. Summary of the key highlights of the SCCT 200 Virtual meeting.

the meeting required adaptations to the program and included the addition of small group 'Ask the experts' sessions, 'On Demand' sessions where talks could be watched in any order and at any point in time, and virtual 'Happy Hour' sessions where participants could get together, socialize, and network in a virtual environment. The entire content of the meeting is now also available for the first time as an "on demand" option in the SCCT's educational hub, allowing for sustained learning and accumulation of CME. In addition, several sessions dedicated to COVID-19 helped SCCT members learn about this rapidly evolving situation, and how to effectively utilize cardiovascular imaging during the current pandemic.[1]

2. Coronary artery disease

The last twelve months have seen several important advances for cardiovascular CT. The European Society of Cardiology guideline on chronic coronary syndromes were published, whilst the SCCT published its expert guidelines on CT perfusion, both providing an impetuous to greater utilization and expansion of the indications for cardiac CT.[2,3]

Stephan Achenbach, President-Elect of the ESC, and past-President of the SCCT, led delegates through the updated ESC guideline highlighting the significant advances CT and why this technique has a prominent role in the new guidelines. In the 2013 guideline coronary CTA received a Class IIa/Level C evidence recommendation only for patients with low pre-test probability patients or with inconclusive stress testing.[4] The accumulated evidence for coronary CTA in the intervening 6 years led to a class I (level B) recommendation and a first line test in patients with suspected coronary artery disease.[2] This level of evidence puts coronary CT on a level footing with functional testing for the first time. Prof. Achenbach highlighted that whilst the guidelines continue to suggest a combination of CT and functional imaging, based on modern patient cohorts, almost all patients presenting with new onset chest pain are at a low-intermediate pre-test probability and would be candidates for CTA. Only >70-year-old men with typical angina have a >50% probability of obstructive coronary artery disease to preferentially suggest functional imaging or invasive angiography.

The meeting explored the use of CTA with or without perfusion imaging and applications to various populations. Dr. David Maron, the lead author of the ISCHEMIA trial, presented the findings and impact of the trial. He highlighted that in the wake of the trial's neutral results for an invasive treatment strategy over conservative management in chronic coronary artery disease, the 8% prevalence of left main disease and a 21% rate of no obstructive disease despite a strongly positive ischemia test, suggests that coronary CTA should play an increasingly central role in future management strategies for coronary artery disease.[5,6] Dr. Chiara Bucciarelli-Ducci (CEO of the Society of Cardiac MRI) gave a spirited defense of the role of perfusion imaging in the gladiatorial arena, where her own gladiator pedigree (Roman heritage and fighting spirit) was pitted against the knowledge and wit of Dr. James Min who provided compelling arguments for an atherosclerotic based approach. Prof. Paul Knaapen expanded on his work on both coronary CT and functional imaging in the PACIFIC study. In previous years, conference attendees heard him speak on the impact of high-risk plaque features on reduced myocardial flow and the comparative diagnostic accuracy of PET, SPECT, CTA and FFRct.[7–9] They now demonstrate the incremental prognostic benefit from a combination of PET perfusion data and the coronary CTA stenosis and high-risk plaque features, where the worst outcomes occur when all three of these are positive. The importance of a combined anatomical functional assessment was also the focus of several talks in the 'Women and Atherosclerosis' section due to the high prevalence of coronary microvascular dysfunction (CMD) in women.[10] Dr. Viviany Taqueti discussed recent work showing the impact of diffuse coronary atherosclerosis on myocardial blood flow, with significantly higher plaque burden in those with CMD, suggesting a related pathogenesis.[11]

Whilst multiple trials have looked at the role of coronary CTA in acute chest pain these have traditionally focused on those with normal ECG and troponins at baseline. In Dr. Todd Villines top 8 papers of the year talk, he discussed the results of the VERDICT CT sub-study and CARMENTA trial[12,13] that evaluated the role of coronary CTA in low risk non-ST elevation myocardial infarction patients. These trials demonstrated that coronary CTA is highly accurate for the diagnosis and exclusion of significant coronary artery disease, and facilitated the safe deferral of a third of cases from invasive coronary angiography. These results were of particular practical importance this year in light of the COVID-19 pandemic as starkly highlighted by Drs. Gianluca Pontone, Ron Blankstein, and Andrew Choi. In a special COVID-19 session, they spoke on the added utility that coronary and cardiac CTA provide in the pandemic, including the avoidance of invasive and aerosol generating procedures, such as diagnostic invasive catheter angiograms in acute chest pain, and exclusion of left atrial thrombus transesophageal echocardiography.[1] Compared with the alternatives, Dr. Choi explained that CT requires less staff, less personal protective equipment, and less aerosol generation, whilst maintaining high diagnostic accuracy, making it a safe and fundamental test in the current COVID-19 climate.

Coronary artery calcium scoring (CACS) continued to be a focus in 2020, with Dr. Michael Blaha discussing recent results of studies within the MESA population. These included the 5 year warranty period of CACS 0, with this being slightly shorter in people with diabetes (3.4 years) and slightly longer in people of East Asian descent (7.1 years).[14] He also highlighted the beneficial impact CACS might have on selecting those who have most to gain from the use of aspirin as a primary preventative agent.[15] These findings were further complemented by an excellent presentation from Dr. Donghee Han in the Young Investigator Award session on the clinical significance of subtle coronary artery calcification. This is calcification that is < 130HU, or <1mm3. He showed that in the CONFIRM registry that this plaque was a significant predictor of future cardiovascular events, and future plaque development. Based on these works, and many more, Dr. Michael Shapiro argued that although we have the data to support utilization of CACS in clinical practice, it is barriers in insurance coverage, and patient and clinician awareness, that are slowing its uptake in clinical practice. As well as advocacy efforts from groups like the SCCT, he also highlighted that the results of two ongoing prospective outcome trials, the ROBINSCA and DANCAVAS trials, will likely be key in driving greater CACS utilization.[16,17] Dr Donnelly pulled much of this together in his talk on the future of CAD-RADS and CTCA reporting (Fig. 2).

3. Structural heart disease

The growth of CTA in structural intervention was well demonstrated this year by the diversity and quality of talks. Where previously these had focused predominantly on transcatheter aortic valve replacement (TAVR) and transcatheter mitral valve replacement (TMVR),[9,18] the scope of structural cardiovascular CT now extends to paravalvular leak closure, post-myocardial infarction ventricular septal defect closure, planning of pulmonary arterial and venous intervention, and thoracic

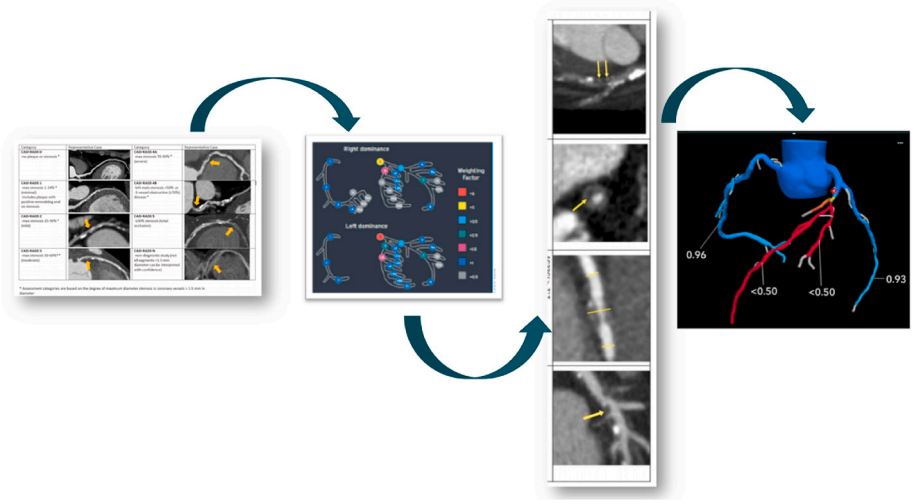

Fig. 2. Dr. Donnelly's prediction for the future evolution of CAD-RADs incorporating lesion location and plaque composition akin to the SYNTAX score, further augmented by FFRct.

and lower limb procedures.

That is not to say TAVR did not get adequate attention. Dr Jonathon Leipsic spoke eloquently on the results and implications of CT sub-studies in two low-risk TAVR trials published earlier this year focusing hypo-attenuated leaflet thickening.[19,20] These highlighted the highly dynamic nature of HALT with 50% naturally disappearing between 30 days and 1 year, and 20% spontaneously appearing at 1 year despite a normal scan at 30 days. This continues to be a significant clinical conundrum as highlighted by the GALILEO 4D trial showing that routine use of anticoagulants better reduced the prevalence of HALT than antiplatelet agents, but also was associated with a higher risk of death, or thromboembolic complications, and a higher risk of bleeding than an antiplatelet-based strategy.[21] This remains an important and controversial issue to the cardiovascular CT community was well evidenced by its prominence in the 'Ask the Experts' session.

In the assessment of mitral valve disease, Dr. Mayra Guerrero's paper on predicting valve embolization in valve-in-mitral-annular-calcification procedures was highlighted as one of the key papers of the year by Dr. Todd Villines (Fig. 3).[22] This compliments work presented as an abstract at last year's meeting and subsequently published in the JCCT on predicting paravalvular leakage in TMVR procedures.[23] Both these manuscripts build well upon existing literature on the utility that CTA can bring to planning these complex procedures.

4. Advanced analytics

This year saw a continued progression of advanced analytics into the mainstream program, with two sessions dedicated to artificial intelligence (AI) and machine learning (ML), and 4 of the best abstract finalists being based on AI/ML, deep learning (DL), and/or Radiomics. In these sessions, attendees got both a thorough overview of the underlying technologies and a glimpse into their growing penetrance into clinical practice.

Radiomics for textural analysis combined with ML has seen significant progression in the last year. Dr. Charalambos Antoniades presented data on how identifying pericoronary fat attenuation using radiomics significantly improved risk prediction in the SCOTHEART dataset,[24] while Dr. Andrew Lin presented how it could help differentiate patients with acute MI from those with stable coronary artery disease in the Young Investigator award session. Dr. Marton Kolossvary gave an excellent talk on the use of radiomics to characterize both plaque and risk in coronary CT.[25] The use of AI in clinical practice was built upon further by Dr. Jelmer Walterink and Dr. Ivana Isgum who demonstrated how improved deep learning segmentation was accelerating simple, but time consuming, tasks like calcium quantification and myocardial chamber segmentation.[26] Dr. Piotr Slomka expanded the discussion into how a clinical machine learning model, combined with CACS, provided the best predictors of clinical outcome in the CONFIRM study.[27] Novel research in AI was the focus of the Best Abstract sessions with Dr. Andrew Choi presenting the results of CLARIFY (CT EvaLuation by ARtificial Intelligence For Atherosclerosis, Stenosis and Vascular MorphologY) for rapid, fully automated CCTA analysis and Dr. Abdul Ihdayhid discussing feasibility and performance of fully automated calcium scoring using machine learning.

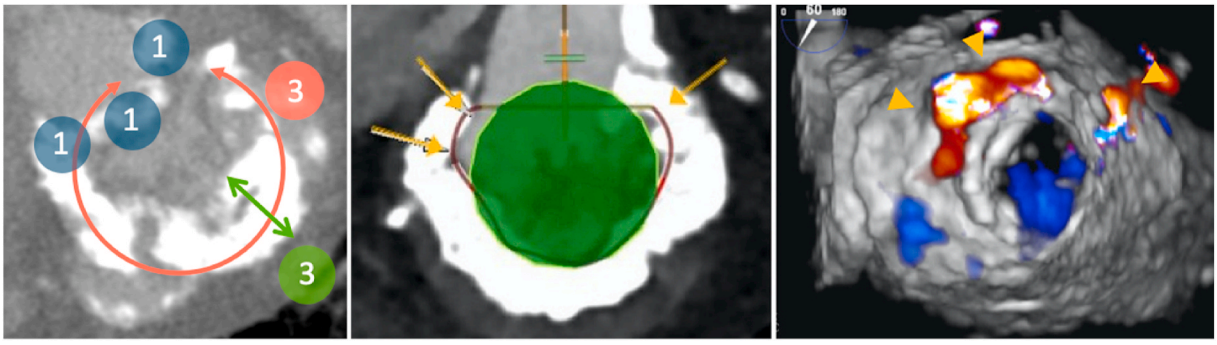

Fig. 3. Advances in transcatheter mitral valve procedural planning, with the MAC scoring system (left) as proposed by Dr Guerrero for reducing the risk of embolization, and the predicting the risk of post procedural PVL (middle and right).

This technology also got a thorough interrogation in the gladiatorial arena, with Dr. Pat Maurovich-Horvat arguing for the integral role of this technology in the future, while Dr. Michael Lu highlighted the many issues and pitfalls that still plague many studies in this field. Attendees left this with an appreciation that while the field holds great promise, more robust prospective clinical trials are required before this can be firmly adopted into clinical practice.

5. Society, advocacy, and social media

Despite a downturn in social media engagement at other recent society annual meetings, the SCCT community proved themselves to be as engaged and vivacious as always.[28,29] There were over 38 million #SCCT2020 impressions during the meeting from 5900 tweets posted by designated social media ambassadors, 700 actively engaged social media participants, and countless others in the medical community following online. In a short time, the SCCT became the most tweeted annual medical meeting in the world, bucking more global trends and extending the reach of the meeting. Best "tweet" prizes were awarded to: (1) Dr. David Hur (1st) for his "tweetorial" on meeting highlights and CT scan safety; (2) Dr. Prashant Nagpal (2nd) for his tweetorial on bridging the gender gap in cardiovascular CT covering Dr. Pamela's Woodard's talk and on cardiovascular CT in congenital heart disease covering Dr. Stout's talk; and (3) Dr. Ritu Thamman covering talks on calcium scoring in novel populations (e.g., diabetes) and atherosclerosis by Drs. Blaha and Budoff respectively. New hashtags were born to reflect SCCT priorities in the coming year including #SCCTVillage and #WomeninCCT.

Several talks, and a panel discussion which included leaders from other societies, payors, and industry partners, focused on ongoing advocacy efforts within the society. That these are essential to ongoing incorporation of coronary CTA in clinical practice is undeniable, and the 31% decrease in the payment for CTA is a worrying trend, but one that numerous efforts are focused on addressing within the SCCT, American College of Cardiology, and American College of Radiology.

The meeting also demonstrated the continued efforts for increased representation of women in the field of cardiac imaging. Although 40% of moderators in the current meeting were women, it is acknowledged that there is considerable room for improvement. Dr. Pamela Woodward gave an excellent account of her own experiences as a woman in cardiac imaging, highlighting her challenging path to Professorship. Now that she, and several others like her, are in positions of influence, active participation within the SCCT by women will continue to build momentum.

The Women in CT Happy Hour was well-attended, with robust and enthusiastic discussion regarding the engagement of women physicians in Cardiac CT. Despite the universal sense that it was too short, the meeting proved to be productive in generating a priority list of tasks that would increase participation of women in Cardiac CT. These ideas were further solidified at the SCCT Board Meeting, with the intention of creating a database of women in Cardiac CT to increase and build networking, notoriety and engagement within the community.

The addition of Dr. Kavitha Chinnaiyan to the SCCT Executive Committee and Dr. Michelle Williams to the SCCT Board of Directors are more positive steps in increasing the diversity of the SCCT leadership. Dr. Nidhi Madan, the chair-elect of the FiRST committee, highlighted current challenges in training, and how she sees online training, and greater standardization of training requirements across specialties as being key to the continued growth of CTA.

6. Awards and accolades

A Society is defined both by the leaders who carry it forward and the successors they nurture and create to continue the journey after their departure. The SCCT is rich in both, as witnessed by the range of people attending the ASM, and in the exceptional caliber of those awarded prizes at the meeting.

The Arthur S. Agatston Cardiovascular Disease Prevention Award was presented to Dr. Khurram Nasir in recognition of his extensive contributions to cardiovascular disease prevention through the assessment of risk factors, particularly coronary atherosclerosis. Dr. Nasir's work to promote understanding of coronary artery calcium scoring through the "power of zero" concept and enhance shared decision-making among clinicians and their patients has had a major impact on strategies to optimize the management and treatment of cardiovascular disease. In addition, his work was highly influential in shaping the recent cholesterol and prevention guidelines.

The SCCT gold medal was awarded to Dr. John Lesser for his exemplary leadership in SCCT, as displayed throughout his long service on the Board of Directors, dating from the Society's inception to 2019. This award also recognizes Dr. Lesser's many contributions as SCCT President in 2012–2013, a program planner and faculty for numerous conferences, workshops, and Annual Scientific Meetings, as an esteemed mentor who paved the way for many of his colleagues to excel, and finally as an indefatigable champion of the SCCT mission.

The Achenbach Pioneer Award in Cardiovascular Computed Tomography was awarded to Dr. Thomas J. Brady for his visionary efforts to invest in research and development that was necessary to propel the field of cardiac CT in the earliest stages, as well as for his leadership and impactful mentorship of early work on plaque characterization and CT perfusion.

Dr. Andrew Lin won the Canon Young Investigator Award – awarded to the best abstract presented by someone within 5 years of completion of training – for his presentation on radiomic analysis of pericoronary fat in patients with acute myocardial infarcts, stable coronary artery disease and healthy controls.

Finally, Dr. Choi received the SCCT-CVRF of Southern California Best Abstract Award as well as Runner-Up presentation exploring data from CLARIFY that evaluated the use of a novel AI approach for the evaluation of stenosis or plaque quantification in comparison to Level 3 consensus readers.

We look forward to welcoming and engaging you (in person or virtually) at the next SCCT Annual Scientific Meeting to be held in Montreal, Canada from July 15th-18th 2021.

Funding

No relevant sources to declare.

Declaration of competing interest

The authors declare no relevant competing interests.

References

1. Choi AD, Abbara S, Branch KR, et al. Society of cardiovascular computed tomography guidance for use of cardiac computed tomography amidst the COVID-19 pandemic endorsed by the American College of Cardiology. *J Cardiovasc Comput Tomogr*. 2020;14(2):101–104. https://doi.org/10.1016/j.jcct.2020.03.002.
2. Knuuti J, Wijns W, Saraste A, et al. ESC Guidelines for the diagnosis and management of chronic coronary syndromes. *Eur Heart J*. 2019. https://doi.org/10.1093/eurheartj/ehz425. August 2019.
3. Patel AR, Bamberg F, Branch K, et al. Society of cardiovascular computed tomography expert consensus document on myocardial computed tomography perfusion imaging. *J Cardiovasc Comput Tomogr*. 2020;14(1):87–100. https://doi.org/10.1016/j.jcct.2019.10.003.
4. Montalescot G, Sechtem U, Achenbach S, et al. ESC guidelines on the management of stable coronary artery disease. *Eur Heart J*. 2013;34(38):2949–3003. https://doi.org/10.1093/eurheartj/eht296, 2013.
5. Hochman JS, Reynolds HR, Bangalore S, et al. Baseline characteristics and risk profiles of participants in the ISCHEMIA randomized clinical trial. *JAMA Cardiol*. 2019;10016:1–14. https://doi.org/10.1001/jamacardio.2019.0014.
6. Maron DJ, Hochman JS, Reynolds HR, et al. Initial invasive or conservative strategy for stable coronary disease. *N Engl J Med*. 2020:1–12. https://doi.org/10.1056/nejmoa1915922.

7. Driessen RS, Stuijfzand WJ, Raijmakers PG, et al. Effect of plaque burden and morphology on myocardial blood flow and fractional flow reserve. *J Am Coll Cardiol*. 2018;71(5):499–509. https://doi.org/10.1016/j.jacc.2017.11.054.
8. Driessen RS, Danad I, Stuijfzand WJ, et al. Comparison of coronary computed tomography angiography, fractional flow reserve, and perfusion imaging for ischemia diagnosis. *J Am Coll Cardiol*. 2019;73(2):161–173. https://doi.org/10.1016/j.jacc.2018.10.056.
9. Weir-McCall JR, Nicol E, Abbara S, et al. Highlights of the fourteenth annual scientific meeting of the society of cardiovascular computed tomography. *J Cardiovasc Comput Tomogr*. 2019;December. https://doi.org/10.1016/j.jcct.2019.12.034.
10. Truong QA, Rinehart S, Abbara S, et al. Coronary computed tomographic imaging in women: an expert consensus statement from the Society of Cardiovascular Computed Tomography. *J Cardiovasc Comput Tomogr*. 2018;12(6):451–466. https://doi.org/10.1016/j.jcct.2018.10.019.
11. AlBadri A, Eshtehardi P, Hung OY, et al. Coronary microvascular dysfunction is associated with significant plaque burden and diffuse epicardial atherosclerotic disease. *JACC Cardiovasc Interv*. 2019;12(15):1519–1520. https://doi.org/10.1016/j.jcin.2019.05.003.
12. Linde JJ, Kelbæk H, Hansen TF, et al. Coronary CT angiography in patients with non-ST-segment elevation acute coronary syndrome. *J Am Coll Cardiol*. 2020;75(5):453–463. https://doi.org/10.1016/j.jacc.2019.12.012.
13. Smulders MW, Kietselaer BLJH, Wildberger JE, et al. Initial imaging-guided strategy versus routine care in patients with non–ST-segment elevation myocardial infarction. *J Am Coll Cardiol*. 2019;74(20):2466–2477. https://doi.org/10.1016/j.jacc.2019.09.027.
14. Dzaye O, Dardari ZA, Cainzos-Achirica M, et al. Incidence of new coronary calcification: time to conversion from CAC = 0. *J Am Coll Cardiol*. 2020;75(13):1610–1613. https://doi.org/10.1016/j.jacc.2020.01.047.
15. Cainzos-Achirica M, Miedema MD, McEvoy JW, et al. Coronary artery calcium for personalized allocation of aspirin in primary prevention of cardiovascular disease in 2019. *Circulation*. 2020;141(19):1541–1553. https://doi.org/10.1161/CIRCULATIONAHA.119.045010.
16. Vonder M, van der Aalst CM, Vliegenthart R, et al. Coronary artery calcium imaging in the ROBINSCA trial: rationale, design, and technical background. *Acad Radiol*. 2018;25(1):118–128. https://doi.org/10.1016/j.acra.2017.07.010.
17. Kvist TV, Lindholt JS, Rasmussen LM, et al. The DanCavas pilot study of multifaceted screening for subclinical cardiovascular disease in men and women aged 65–74 years. *Eur J Vasc Endovasc Surg*. 2017;53(1):123–131. https://doi.org/10.1016/j.ejvs.2016.10.010.
18. Weir-McCall JR, Madan N, Villines TC, et al. Highlights of the thirteenth annual scientific meeting of the society of cardiovascular computed tomography. *J Cardiovasc Comput Tomogr*. 2018;12(6):523–528. https://doi.org/10.1016/j.jcct.2018.09.005.
19. Blanke P, Leipsic JA, Popma JJ, et al. Leaflet thickening or immobility following aortic valve replacement: results from the evolut low risk sub-study. *J Am Coll Cardiol*. 2020. https://doi.org/10.1016/j.jacc.2020.03.022.
20. Makkar RR, Blanke P, Leipsic J, et al. Subclinical leaflet thrombosis in transcatheter and surgical bioprosthetic valves: PARTNER 3 cardiac computed tomography substudy. *J Am Coll Cardiol*. 2020. https://doi.org/10.1016/j.jacc.2020.04.043.
21. de Backer O, Dangas GD, Jilaihawi H, et al. Reduced leaflet motion after transcatheter aortic-valve replacement. *N Engl J Med*. 2020;382(2):130–139. https://doi.org/10.1056/NEJMoa1911426.
22. Guerrero M, Wang DD, Pursnani A, et al. A cardiac computed tomography–based score to categorize mitral annular calcification severity and predict valve embolization. *JACC Cardiovasc Imaging*. May 2020. https://doi.org/10.1016/j.jcmg.2020.03.013.
23. Morris MF, Pena A, Kalya A, et al. Predicting paravalvular leak after transcatheter mitral valve replacement using commercially available software modeling. *J Cardiovasc Comput Tomogr*. April 2020. https://doi.org/10.1016/j.jcct.2020.04.007.
24. Oikonomou EK, Williams MC, Kotanidis CP, et al. A novel machine learning-derived radiotranscriptomic signature of perivascular fat improves cardiac risk prediction using coronary CT angiography. *Eur Heart J*. 2019;40(43):3529–3543. https://doi.org/10.1093/eurheartj/ehz592.
25. Kolossváry M, Karády J, Kikuchi Y, et al. Radiomics versus visual and histogram-based assessment to identify atheromatous lesions at coronary CT angiography: an ex vivo study. *Radiology*. 2019;293(1):89–96. https://doi.org/10.1148/radiol.2019190407.
26. van Velzen SGM, Lessmann N, Velthuis BK, et al. Deep learning for automatic calcium scoring in CT: validation using multiple cardiac CT and chest CT protocols. *Radiology*. 2020;295(1):66–79. https://doi.org/10.1148/radiol.2020191621.
27. Al'Aref SJ, Maliakal G, Singh G, et al. Machine learning of clinical variables and coronary artery calcium scoring for the prediction of obstructive coronary artery disease on coronary computed tomography angiography: analysis from the CONFIRM registry. *Eur Heart J*. 2019;(September). https://doi.org/10.1093/eurheartj/ehz565.
28. Choi AD, Feuchtner GM, Weir-McCall J, Shaw LJ, Min JK, Villines TC. Accelerating the future of cardiac CT: social media as sine qua non? *J Cardiovasc Comput Tomogr*. 2020;(January). https://doi.org/10.1016/j.jcct.2020.01.011, 0-1.
29. Choi AD, Parwani P, Michos ED, et al. The global social media response to the 14th annual Society of Cardiovascular Computed Tomography scientific sessions. *J Cardiovasc Comput Tomogr*. 2020. https://doi.org/10.1016/j.jcct.2019.12.003.