Alice Chu, BS
Fabian Vargas, MD
Maen Assali, MD
Nishant R. Shah, MD, MPH
Anthony M. Reginato, MD, PhD
Wen-Chih Wu, MD
Gaurav Choudhary, MD
Alan R. Morrison, MD, PhD*

*Providence VA Medical Center
Research (151)
830 Chalkstone Avenue
Providence, Rhode Island 02908
E-mail: alan_morrison@brown.edu

https://doi.org/10.1016/j.jcmg.2019.10.019

REFERENCES

1. Bardin T, Richette P. Impact of comorbidities on gout and hyperuricaemia. BMC Med 2017;15:123.

2. Moyer VA, U.S. Preventive Services Task Force. Screening for lung cancer: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med 2014;160:330–8.

3. Christensen JL, Sharma E, Gorvitovskaia AY, et al. Impact of slice thickness on the predictive value of lung cancer screening computed tomography in the evaluation of coronary artery calcification. J Am Heart Assoc 2019;8: e010110.

4. Stone NJ, Robinson JG, Lichtenstein AH, et al. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults. J Am Coll Cardiol 2014;63:2889–934.

Association Between Recreational Cannabis Use and Cardiac Structure and Function

Cannabis is one of the most widely produced and consumed recreational drugs in the world, with over 192 million global users (1). The World Health Organization has warned against the potential harmful health effects of nonmedicinal cannabis use and highlighted the need for more research assessing the link between cannabis smoking and cardiovascular disease (CVD) in adults (2). Legalization of cannabis is increasing. In the United States, recreational cannabis use is legal in 12 states and has been decriminalized in many others. Discussions on the potential public health impact are hampered by gaps in evidence and variable quality of available data. Little or no mention of cannabis exists in CVD risk assessments or lifestyle advice guideline (3,4).

We studied the association of cannabis use with cardiac structure and function using cardiovascular magnetic resonance (CMR) parameters in the UK Biobank population study (covered by the general ethical approval for UK Biobank studies from the NHS National Research Ethics Service [16/NW/0274]).

Participants without CVD but with CMR imaging data were included (5). Self-reported cannabis use was categorized as rare/never: (no use or less than monthly use of cannabis), previous regular (weekly or daily use of cannabis up to 5 years before the interview), or current regular (weekly or daily cannabis use within 5 years of the interview). Investigators were blinded to cannabis use. CMR scanning was performed at 1.5-T (MAGNETOM Aera, Siemens, Munich, Germany) with CVI42, version 5.1.1, post-processing software (Circle Cardiovascular Imaging Inc., Calgary, Canada) and semiautomated analysis of left ventricular myocardial tagged cine images was performed with CIMTag2D, version 8.1.5 (CIM Software, Medina, Minnesota). Myocardial global circumferential strain at the mid-left ventricular level was reported in absolute values.

Analysis included 3,407 individuals (age: 62 ± 7 years; 55% female), with 47 current regular, 105 previously regular, and 3,255 rare/never users. Current regular users were more likely to be younger, male, and current tobacco smokers and have greater levels of social deprivation compared with rare/never users and previous regular users. They were also less likely to be taking antihypertension medication. Regular cannabis use was associated with larger indexed left ventricular end diastolic volume (+5.31 ml/m²; 95% confidence interval [CI]: 1.4 to 9.3 ml/m²; p = 0.008), end systolic volume (+3.3 ml/m²; 95% CI: 0.78 to 5.83 ml/m²; p = 0.010), and impaired global circumferential strain (−0.78; 95% CI: −1.47 to −0.09; p = 0.026) compared with rare/no cannabis use, even after adjustment for potential confounders including age, sex, body mass index, systolic blood pressure, use of cholesterol medication, diabetes, smoking, and alcohol consumption (**Figure 1**). After multivariable adjustment, there were no differences between left ventricular myocardial mass, ejection fraction, and stroke volume or right ventricular, left atrial, and right atrial parameters. Previous cannabis users had similar parameters to rare/never users.

To the best of our knowledge, this is the first study to systematically report alterations in cardiac

FIGURE 1 Cardiac Chamber and Function Changes With Regular Versus Rare/Never Recreational Cannabis Use (N = 3,407)

	Ventricular measures	Right ventricle	Left ventricle	Atrial measures	Right atrium	Left atrium
Morphology	End diastolic volume	↑	↑ *#	Maximum volume	↔	↔
	End systolic volume	↑	↑ *#	Minimum volume	↔	↔
	Stroke volume	↑	↑			
	Mass		↑ #			
Function	Ejection fraction	↔	↔	Emptying fraction	↔	↔
	Global circumferential strain		↓ *#			

Regular cannabis use was independently associated with adverse changes in left ventricle size and subclinical dysfunction compared with rare/never cannabis use.
*Changes remain significant after multivariable adjustment. #Changes remain significant after adjustment for age and sex.

structure and function associated with recreational cannabis use using CMR, the current gold standard for cardiac chamber assessment. The exact mechanisms for the observed changes are not currently known. Potential study limitations include the mainly white study population (96%); use of self-reported cannabis consumption with possible recall bias; and observational study design, whereby residual confounding cannot be fully excluded, and it is unclear whether the associations observed are due to cannabis use alone or other unmeasured confounders. Cannabis also remains illegal in the United Kingdom, creating additional barriers to reporting use.

Regular cannabis use was independently associated with adverse changes in left ventricle size and subclinical dysfunction compared with rare/never cannabis use, whereas previous regular cannabis use was not. Findings should be interpreted with caution, and further research is required to understand the potential pathophysiology, dose-response effects of cannabis use, and long-term implications of regular use on the cardiovascular system. Health care professionals and policy makers may need to advise caution on regular recreational cannabis use until such systematic research is available.

Mohammed Y. Khanji, MBBCh, PhD*
Magnus T. Jensen, MD, PhD, MSc
Asmaa A. Kenawy, MD
Zahra Raisi-Estabragh, MD
Jose M. Paiva, MSc
Nay Aung, MD
Kenneth Fung, MD
Elena Lukaschuk, MSc
Filip Zemrak, MD, PhD
Aaron M. Lee, BSc, MD, PhD
Ahmet Barutcu, MD
Edd Maclean, MD
Jackie Cooper, MSc
Stefan K. Piechnik, MD, PhD
Stefan Neubauer, MD, PhD
Steffen E. Petersen, MSc, MPH, MD, PhD

*Queen Mary University of London
Newham University Hospital
Barts Health NHS Trust
Glen Road
London E13 8SL
United Kingdom
E-mail: m.khanji@qmul.ac.uk

https://doi.org/10.1016/j.jcmg.2019.10.012

REFERENCES

1. United Nations Office on Drugs and Crime (UNODC). Statistics and Data. Available at: https://dataunodc.un.org/drugs/prevalence_regional. Accessed April 7, 2019.

2. World Health Organization. The Health and Social Effects of Nonmedical Cannabis Use. Available at: https://www.who.int/substance_abuse/publications/msbcannabis.pdf. Accessed February 24, 2018.

3. Khanji MY, van Waardhuizen CN, Bicalho VVS, Ferket BS, Hunink MGM, Petersen SE. Lifestyle advice and interventions for cardiovascular risk reduction: a systematic review of guidelines. Int J Cardiol 2018;263:142–51.

4. Khanji MY, Bicalho VVS, van Waardhuizen CN, Ferket BS, Petersen SE, Hunink MGM. Cardiovascular risk assessment: a systematic review of guidelines. Ann Intern Med 2016;165:713–22.

5. Petersen SE, Matthews PM, Francis JM, et al. UK Biobank's cardiovascular magnetic resonance protocol. J Cardiovasc Magn Reson 2016;18:8.

Performing Computed Tomography Instead of Invasive Coronary Angiography

Sex Effects in Patients With Suspected CAD

Around 50% of women die of cardiovascular diseases. Diagnostic accuracy in detecting significant coronary artery disease (CAD) differs between men and women, underlining the need for further investigation of sex-specific differences (1). In this subanalysis of the prospective CAD-Man (Coronary Artery Disease Management) trial, we evaluated if women, compared with men, benefit from undergoing computed tomography angiography (CT) instead of invasive coronary angiography (ICA) in terms of procedural complications. Events in the follow-up period were defined in the study protocol (2). The CAD-Man trial showed that CT is a safe and accurate gatekeeper to ICA. Initial CT instead of ICA reduced minor complications and the length of hospitalization, while increasing the diagnostic yield of ICA.

Patients with suspected CAD based on atypical chest pain and a clinical indication for ICA were randomly assigned to CT or ICA (2). Major procedural complications (death, stroke, myocardial infarction, and other complications prolonging hospitalization by at least 24 h) and minor procedural complications (e.g., groin hematoma, groin pain, infection, allergy, thrombosis, and arteriovenous fistula), defined as occurring within 48 h of the last related procedure, were compared between men and women.

The sex analysis was a planned secondary analysis (2). The chi-square test was used to evaluate minor and major procedural complications. Additionally, a post hoc power calculation was performed. The calculations were performed by nQuery release 7 (Statistical Solutions Ltd., Boston, Massachusetts). Assuming the observed overall complication rate of 7.3% and the sample size of the study, differences in complication rates of 8% (i.e., 3.3% vs. 11.3%) or larger could have been detected (power 80%, type I error = 0.05; 2-sided).

Procedural complications occurred less often in women in the CT group compared with the ICA group (CT: 1.1% vs. ICA: 11.5%). Procedural complications were similar in men in both groups (CT: 7.6% vs. ICA: 9.5%). Major procedural complications were uncommon in the CT and ICA group in both sexes (Table 1). Minor procedural complications occurred less often in women in the CT group compared with the ICA group (Table 1). The interaction sex study arm regarding procedural complication was p = 0.072.

The number of any events at long-term follow-up at 3.3 years was similar in women and men in both groups (Table 1).

This study is limited by its single-center design and the small total number of adverse events. Although earlier studies revealed differences between women and men regarding the prevalence and symptoms of CAD, ours is the first study analyzing sex differences in terms of outcomes of diagnostic procedures (CT and ICA). This study shows that women with atypical chest pain and a clinical indication for coronary evaluation may benefit from a strategy based on CT instead of ICA, specifically due to a reduction in minor procedural complications.

Possible reasons for these results are:

1. Having a lower pretest probability of disease than men and a lower rate of complex diseases women are expected to benefit less from initial ICA.
2. Women with obstructive CAD have more comorbidities, present with atypical symptoms, and tend