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Safety of Prolonged Fasting in Patients Who Underwent Percutaneous Coronary Intervention More than One Year Earlier

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Abstract

Background: This study aimed to examine the effect of prolonged fasting on symptoms and major adverse cardiac events (MACE) in patients with percutaneous coronary intervention (PCI) more than 1 year.

Methods: Patients with history of PCI more than 1 year were selected in this study. Patients were instructed how to divide their medication across two meals. We asked patients to immediately stop prospective cohort fasting and contact the clinic if they experienced any signs of cardiovascular disease, including shortness of breath, chest pain, or palpitations. At the end of Ramadan, patients were contacted by telephone and asked about their symptoms, and MACE.

Results: 405 patients were enrolled. There were no significant differences in baseline characteristics between the fasting and non-fasting group. No MACE was reported in either group. In the fasting group, 7 patients (3.4%) stopped fasting during Ramadan due to dyspnea, chest pain, or combined dyspnea and chest pain. In the non-fasting group, 5 patients (2.5%) reported dyspnea, chest pain, or combined dyspnea and chest pain (p=0.581). Patients in fasting group developed more changes in BP (increase or decrease), compare to no fasting group (P=0.04), but changes were not that significant to make patients seek any medical assistances.

Conclusion: In patients with a history of PCI more than 1 year, fasting was not associated with acute health risks. Patient education can play an important role in reducing the risks. (clinicaltrial.gov: NCT04772924, 26/02/2021)

Keywords: Prolonged fasting • Percutaneous coronary intervention • Angioplasty • Major adverse cardiac events

List of abbreviations: MACE: Major Adverse Cardiac Events; PCI: Percutaneous Coronary Intervention; CAD: Obstructive Coronary Artery Disease; BP: Blood Pressure

Introduction

Different periods and patterns of fasting are seen in most religions. During the month of Ramadan, Muslims fast from dawn to sunset, meaning that they avoid eating foods, drinking beverages, and any other oral intake. Muslims change their medication habits during Ramadan and divide their medicines across their two daily meals. Islamic rules restrict Ramadan fasting for ill people whose fasting could worsen their health. In Judaism, fasting means complete cessation of food and drink. Jewish fasting involves fasting for 24 hours beginning at sunset and ending at the next sunset [1-3].

Prolonged fasting helps to improve mental health, for example by reducing anxiety [4]. It also has positive effects on physical health. Fasting leads to an increase in high-density lipoproteins and a reduction in low-density lipoproteins, and these changes reduce the risk of cardiovascular disease [5]. Fasting can also reduce the risk of cardiovascular disease by reducing body weight [6]. Despite these positive effects, prolonged fasting may lead to headaches, heartburn, constipation, dehydration, anemia, and decreased sleep quality, all of which can be harmful [7].

Few published articles have centered on the effects of prolonged fasting in patients who have undergone Percutaneous Coronary Intervention (PCI), a nonsurgical procedure used to treat obstructive Coronary Artery Disease (CAD). PCI techniques have improved rapidly in recent decades, since the first successful percutaneous balloon angioplasty by Gruntzig in 1977 up to the present [8]. Because PCI is effective and relatively inexpensive, more patients receive this type of intervention. For example, the number of PCI centers in the USA grew by 21% from 2003 to 2011 [9].

In patients with stable CAD, Ramadan fasting had no effects on symptoms such as chest pain or dyspnea [10]. Prolonged fasting caused no Major Adverse Cardiac Events (MACE) in patients with stable CAD, although patients with unstable CAD or recent revascularization should avoid it [11]. Ramadan fasting led to MACE in patients who underwent PCI and started fasting immediately after the intervention, and the incidence of MACE decreased 90 days after PCI [12]. Fasting caused MACE in patients with concomitant chronic kidney disease and cardiovascular disease [13]. However, a systematic review showed no association between long-term fasting and the incidence of acute cardiac illness [14].

Many Muslims and Jews with cardiovascular disease have a strong desire to fast despite their illness. This raises questions about the safety of fasting for their health, although a systematic review and meta-analysis by Turin and colleagues showed the safety of fasting in patients with a history of coronary

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artery disease; however the study did not include post PCI patients [15]. The purpose of the present study was to examine the effect of fasting on symptoms in patients who had undergone PCI more than 1 year previously. We also determined the rate of MACE during prolonged fasting.

Methodology

This prospective cohort study was conducted between 25 April and 24 May 2020. The inclusion criteria were history of PCI, and a minimum of 1 year between angioplasty and enrollment in this study. The exclusion criteria were heart failure (ejection fraction <50%), advanced kidney failure (glomerular filtration rate <60 mL/min), unsuccessful revascularization, coronary artery bypass graft, liver cirrhosis, and any acute conditions such as infection that needed repetitive treatment. We also excluded patients whose PCI had been performed less than 1 year prior to the study period, and patients with diabetes who were on insulin treatment.

Between 18 March 2019 and 18 April 2020, patients seen at Cardiovascular Clinic in Shiraz, Iran for their annual check-up were selected. We explained the research project to them, and volunteers were selected. Patients were assigned to the fasting or non-fasting group according to their preference. All volunteers were informed about the details of this research, and provided their written informed consent. Patients who declined to participate in the study were excluded. The protocol was performed in accordance with the Helsinki guidelines and regulations, and was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.MED.REC.1398.465).

Risk factors such as hypertension, diabetes mellitus, dyslipidemia and smoking were considered. Hypertension was defined according to ACC/AHA 2020 guidelines [16]. Diabetes mellitus was diagnosed based on the 2020 ADA guidelines [17]. Dyslipidemia was defined as elevated total cholesterol or low-density lipoprotein cholesterol, or elevated triglycerides, or lowered high-density lipoprotein cholesterol [18]. We measured their blood pressure at the clinic after 15 minutes rest from both brachial for 3 times at baseline, and take a mean BP as an index. We announced them to take their blood pressure after 15 minutes rest from both brachial arteries, at the end of fasting period, 3 times at morning, noon and 4 PM.

Patients were instructed how to divide their medication across the two daily meals before dawn and after sunset during the month of Ramadan. We informed patients to immediately stop fasting and consult the clinic if they experienced any signs of cardiovascular disease, including shortness of breath, chest pain, or palpitations or any uncontrolled blood pressure. At the end of Ramadan, patients were contacted by telephone and asked about their symptoms, including chest pain and dyspnea, uncontrolled hypertension, hospitalization, and MACE. We also asked about their blood pressure. The MACE was defined as acute myocardial infarction, hospitalization due to congestive heart failure, new-onset atrial fibrillation, stroke, or cardiac arrest [19,20]. Symptomatic patients were referred to the clinic for cardiovascular examination.

The study was single-blinded. To blind the researchers, the clinic secretary contacted the patients and asked them not to specify their group (fasting or non-fasting), and then passed the phone to the researcher. We used alphabetical order in each group to blind the statisticians. Patients who fasted during Ramadan were designated with the letter X, and patients who did not fast during Ramadan were designated with the letter Y.

For statistical analyses, we used IBM SPSS software version 25. We used the chi-square test to compare categorical variables and Student's t-test to compare the mean values of continuous variables. The Mann-Whitney U test and Kruskal-Wallis test were used for nonparametric variables. We used a two-way analysis of variance (ANOVA) for comparing the changes between the two groups.

Results

During the study period, 488 eligible patients were referred to the cardiovascular clinic. Based on the exclusion criteria, 83 patients were excluded. A total of 405 patients were enrolled (125 women, 30.9%; 280 men, 69.1%); their mean age was 63.03 ± 9.44 years. Approximately half of the patients (205, 50.6%) were in the fasting group, and 200 patients (49.4%) were in the non-fasting group. The prevalence of risk factors was hypertension in 270 (66.7%), diabetes mellitus in 92 (22.7%), dyslipidemia in 65 (26%), and smoking in 111 (27.4%). Mean Ejection Fraction (EF) was 54% (50%-65%), in fasting and 53.5% (50%-60%) in non-fasting group. Mean Syntax score was 14 (10-27) in fasting and 15 (9-26) in non-fasting group (P=0.67)

Patients in the fasting group fasted for an average of 24.1±8 days. Almost all patients (393, 97%) took their medications regularly as prescribed. There were no significant differences in baseline characteristics between the fasting and non-fasting groups (Table 1).

At the end of Ramadan, no MACE was reported in either group. In the fasting group, 7 patients (3.4%) stopped fasting due to dyspnea, chest pain, or combined dyspnea and chest pain. In the non-fasting group, 5 patients (2.5%) reported dyspnea, chest pain, or combined dyspnea and chest pain (p=0.581) (Table 2). Concerning the blood pressure (BP) changes, 194 (97%) of non-fasting group have no changes in BP, while 2 patients (1%) developed decrease in mean systolic BP (mean 10 mmhg) and 4 patients (2%) developed increase in mean systolic BP (mean 15 mmhg), however in fasting group 178 patient (86.8%) had no changes in BP and 15 patient (7.3%) developed decrease in mean systolic BP (mean 12 mmhg) and 12 patients (5.9%) developed increase in mean systolic BP (mean 15 mmhg). The P value between two groups for decrease in BP was 0.01 and for increase in BP was 0.04. Although these changes were not that significant and caused no need to go to hospital or getting help from any medical assistance.

Discussion

There are about 1.6 billion Muslims in the world [21]. Fasting is obligatory for Muslims during the month of Ramadan, except for those who have medical problems. Every year, many Muslims consult their doctor about fasting despite having underlying diseases. In 2015, there were about 420 million patients with cardiovascular disease worldwide, who thus comprise a large population [22]. Therefore, one of the most important issues related to fasting is the risk this practice may pose for patients with cardiovascular disease.

Amin et al. found that in patients who underwent angioplasty before the beginning of Ramadan, MACE was significantly more frequent in the fasting group than the non-fasting group. They suggested that days elapsed since PCI was an independent risk factor for MACE. From 90 days after PCI, the incidence of MACE decreased significantly [12]. They concluded that fasting

Table 1. Baseline characteristics in the fasting and non-fasting groups.

Parameters	Fasting group	Non-fasting group	p value
Mean age ± SD (years)	64 ± 10	62 ± 9	0.081
Male, n (%)	134 (69.4%)	146 (73.7%)	0.096
Hypertension, n (%)	140 (68.3%)	130 (65%)	0.482
Diabetes mellitus, n (%)	51 (24.9%)	41 (20.5%)	0.293
Dyslipidemia, n (%)	34 (16.6%)	31 (15.5%)	0.766
Smoking, n (%)	52 (25.4%)	59 (29.5%)	0.351
Mean Syntax score	14 (10-27)	15 (9-26)	0.67

Table 2. Frequency of symptoms in the fasting and non-fasting groups.

Parameters	Fasting group (n)	Non-fasting group (n)
Major adverse cardiac events	0	0
Dyspnea	1	2
Chest pain	3	2
Combined chest pain and dyspnea	3	1
Palpitations	0	0

in the first 3 months after PCI was not safe. Pekdemir M, et al. [23] reported that the number of patients referred to the emergency department during the month of Ramadan did not change much compared to the previous month. Raffee LA, et al. [24] concluded that the incidence of acute coronary artery syndrome did not differ significantly between patients who fasted and those who did not fast. We found that in patients who had undergone PCI more than 1 year previously, the prevalence of MACE during Ramadan fasting was zero. This finding suggests that patients who undergo PCI can safely fast if more than 1 year has elapsed since their procedure. The endothelial repair process can take between 5 and 12 months post PCI and this can make thrombose formation by possible dehydration or stress made by prolonged fasting [25,26]. Although our study showed fasting may be safe after 1-year post PCI, future studies should investigate the incidence of MACE by fasting after 6 months post PCI.

Mousavi M, et al. [10] reported that the incidence of chest pain or combined chest pain and dyspnea did not differ significantly between fasting and non-fasting groups in patients with prior PCI or coronary artery bypass graft. Al Suwaidi J, et al. [27] found that patients with stable cardiac disease such as CAD can safely fast. Although we found that 7 patients in the fasting group and 5 patients in the non-fasting group were referred to the clinic because they experienced symptoms or uncontrolled hypertension, the difference between groups was not significant. So prolonged fasting apparently had no significant effect on symptoms in patients who had undergone PCI more than 1 year previously.

In their systematic review, Benaji B, et al. [28] found that fasting was acceptable in patients with diabetes if they modified their diet and medication intake. Azizi F and Siahkolah B, et al. [29] concluded that fasting was safe in the long term for most patients with non-insulin-dependent diabetes mellitus, but that patients in with insulin-dependent diabetes mellitus, strict management of their drug regimens and diet is important before they start to fast. Salti I, et al. [30], in a population-based study, found that severe hypoglycemia was significantly more frequent in patients with diabetes during Ramadan than during other months. In the present study, 92 patients who had diabetes mellitus were on oral medication. We advised them how to divide their medication across the two daily meals while they fasted. Almost all of our patients (97%) adhered to their dosage regimen, and no hypoglycemia symptoms were reported during fasting. Our findings suggest that with appropriate management, fasting is safe in patients with diabetes, and that patient education plays an important role in preventing hypoglycemia.

Fasting leads to weight loss and improvements in metabolic markers such as fasting plasma glucose and blood pressure, and can prevent chronic health problems [31,32]. In addition, prolonged fasting plays an important role in reducing the risk factors for cardiovascular disease. Fasting decreases plasma cholesterol and triglycerides, body mass index, and waist circumference. It also increases high-density lipoprotein cholesterol, which has a protective effect against cardiovascular disease [33]. It therefore appears that fasting can reduce cardiovascular disease by reducing its risk factors. Concerning the BP, our study showed BP changes was more significant in fasting group, but these changes were not that significant to make patients to attend any medical assistance, and with use of medications, patients with hypertension and history of PCI can tolerate fasting very well.

Conclusion

In this prospective cohort study, we found that prolonged fasting was safe in patients who had undergone PCI more than 1 year previously. No MACE was seen during the fasting period. There was no significant difference in the incidence of cardiovascular symptoms between the fasting and non-fasting groups. Patients with diabetes who were using oral medication fasted safely. Patient education can play an important role in reducing the potential risks of fasting.

Study limitations

One of the limitations of this study is that we did not randomize the patients, but assigned them to the fasting or non-fasting group according to their preference. We excluded patients with diabetes who were using insulin medications, patients with an ejection fraction <50%, advanced renal failure, and other conditions noted in the Methods section, and this may have led to an underestimation of the risk of MACE. We followed patients for 1 month; longer follow-up may yield different results. Future studies should investigate the incidence of MACE by fasting in shorter periods after angioplasty.

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References

1. Aslam, Mohamed, and Abdulla Assad. "Drug regimens and fasting during Ramadan: A survey in Kuwait." *Public Health* 100 (1986): 49-53.
2. Aadil, N, I.E Houti and S. Moussamih. “Drug intake during Ramadan." *BMJ* 329 (2004): 778-782.
3. Corn, Kevin, ed. “Fasting and feasting in three traditions: Judaism, Christianity, Islam.” (2006).
4. Mousavi, Seyed Ali, Mansour Rezaei, Baghni Sahar Amiri, and Maryam Seifi. “Effect of fasting on mental health in the general population of Kermanshah, Iran." (2014): 65-70.
5. Qujeq, Durdi, Khezroolla Bijani, Khodaberdi Kalavi, and Javad Mohiti, et al. "Effects of Ramadan fasting on serum low-density and high-density lipoprotein-cholesterol concentrations." *Ann Saudi Med* 22 (2002): 297-299.
6. Johnstone, Alexandra. "Fasting for weight loss: An effective strategy or latest dieting trend?" *Int J Obesity* 39 (2015): 727-733.
7. Pakkir Maideen, Nania Mohamed, Abdurazak Jumale, and Rajkapoor Balasubramaniam. "Adverse health effects associated with Islamic fasting-A literature review." *J Fasting Health* 5 (2017): 113-118.
8. Bennett, Johan, and Christophe Dubois. "Percutaneous coronary intervention, a historical perspective looking to the future." *J Thorac Dis* 5 (2013): 367.
9. Langabeer, James R., Timothy D. Henry, Dean J. Kereiakes, and Jami DelliFraine, et al. "Growth in percutaneous coronary intervention capacity relative to population and disease prevalence." *J Am Heart Assoc* 2 (2013): e000370.
10. Mousavi, Mehdi, SadafSadat Mirkarimi, Gita Rahmani, and Ehsan Hosseinzadeh, et al. "Ramadan fast in patients with coronary artery disease." *Iran Red Crescent Med J* 16 (2014): e7887.
11. Pasha, Majed Chamsi, and Hassan Chamsi Pasha. "The cardiac patient in Ramadan." *Avicenna J Med* 6 (2016): 33-38.
12. Amin, Osama A., and Ahmed Alaarag. "The safety of Ramadan fasting following percutaneous coronary intervention." *BMC Cardiovasc Disord* 20 (2020): 1-11.
13. NasrAllah, Mohamed M., and Noha A. Osman. "Fasting during the month of Ramadan among patients with chronic kidney disease: Renal and cardiovascular outcomes." *Clin Kidney J* 7 (2014): 348-353.
14. Salim, Imtiaz, Jassim Al Suwaidi, Wissam Ghadban, and Hani Alkilani, et al. "Impact of religious Ramadan fasting on cardiovascular disease: A systematic review of the literature." *Curr Med Res Opin* 29 (2013): 343-354.
15. Turin, Tanvir C., Salim Ahmed, Nusrat S. Shommu, and Arfan R. Afzal, et al. "Ramadan fasting is not usually associated with the risk of cardiovascular events: A systematic review and meta-analysis." *J Fam Community Med* 23 (2016): 73.
16. Unger, Thomas, Claudio Borghi, Fadi Charchar, and Nadia A. Khan, et al. "2020 International Society of Hypertension global hypertension practice guidelines." *Hypertension* 75 (2020): 1334-1357.
17. American Diabetes Association. "Standards of medical care in diabetes—2010." *Diabetes Care* 40 (2017): S11-S24.
18. Teramoto, Tamio, Jun Sasaki, Shun Ishibashi, and Sadatoshi Birou, et al. "Diagnostic criteria for dyslipidemia executive summary of the Japan Atherosclerosis Society

(JAS) guidelines for the diagnosis and prevention of atherosclerotic cardiovascular diseases in Japan—2012 version." *J Atheroscler Thromb* 20 (2013): 655-660.

19. Chong, Carol P., Wen Kwang Lim, Elena Velkoska, and William J. van Gaal, et al. "N-terminal pro-brain natriuretic peptide and angiotensin-converting enzyme-2 levels and their association with postoperative cardiac complications after emergency orthopedic surgery." *Am J Cardiol* 109 (2012): 1365-1373.
20. Choi, Byoung Geol, Seung-Woon Rha, Seong Gyu Yoon, and Cheol Ung Choi, et al. "Association of major adverse cardiac events up to 5 years in patients with chest pain without significant coronary artery disease in the Korean population." *J Am Heart Assoc* 8 (2019): e010541.
21. Desilver, D. and D. Masci. "World's Muslim population more widespread than you might think." *Pew Res Center* (2017): 31.
22. Roth, Gregory A., Catherine Johnson, Amanuel Abajobir, and Foad Abd-Allah, et al. "Global, regional, and national burden of cardiovascular diseases for 10 causes, 1990 to 2015." *J Am Coll Cardiol* 70 (2017): 1-25.
23. Pekdemir, Murat, Murat Ersel, Serkan Yilmaz, and Mecit Uygun. "No significant alteration in admissions to emergency departments during Ramadan." *J Emerg Med* 38 (2010): 253-256.
24. Raffee, Liqaa A., Khaled Z. Alawneh, Mohammad Khaled Al Suleiman, and Rashid K. Ibdah, et al. "An observational study of the occurrence of acute coronary syndrome (ACS) among Jordanian patients: Identifying the influence of Ramadan fasting." *Ann Med Surg* 59 (2020): 171-175.
25. Cornelissen, Anne, and Felix Jan Vogt. "The effects of stenting on coronary endothelium from a molecular biological view: Time for improvement?" *J Cell Mol Med* 23 (2019): 39-46.
26. Van Belle, Eric, Christophe Bauters, Takayaki Asahara, and Jeffrey M. Isner. "Endothelial regrowth after arterial injury: from vascular repair to therapeutics." *Cardiovasc Res* 38 (1998): 54-68.
27. Al Suwaidi, Jassim, Mohammad Zubaid, Wael A. Al-Mahmeed, and Ibrahim Al-Rashdan, et al. "Impact of fasting in Ramadan in patients with cardiac disease." *Saudi Med J* 26 (2005): 1579-1583.
28. Benaji, B, N. Mounib, R. Roky, and N. Aadil, et al. "Diabetes and Ramadan: Review of the literature." *Diabetes Res Clin Pract* 73 (2006): 117-125.
29. Azizi, Fereidoun, and Bhenam Siahkolah. "Ramadan fasting and diabetes mellitus." *Arch Iran Med* 6 (2003): 237-242.
30. Salti, Ibrahim, Eric Bénard, Bruno Detournay, and Monique Bianchi-Biscay, et al. "A population-based study of diabetes and its characteristics during the fasting month of Ramadan in 13 countries: Results of the epidemiology of diabetes and Ramadan 1422/2001 (EPIDIAR) study." *Diabetes Care* 27 (2004): 2306-2311.
31. Pakkir Maideen, Naina Mohamed, Abdurazak Jumale, and Jamil IH Alatrash, et al. "Health benefits of Islamic intermittent fasting." *J Nutr Fasting Health* 5 (2017): 162-171.
32. Ünalacak, Murat, Ismail Hamdi Kara, Davut Baltaci, and Özgür Erdem, et al. "Effects of Ramadan fasting on biochemical and hematological parameters and cytokines in healthy and obese individuals." *Metab Syndr Relat Disord* 9 (2011): 157-161.
33. Nematy, Mohsen, Maryam Alinezhad-Namaghi, Masoud Mahdavi Rashed, and Mostafa Mozhdehifard, et al. "Effects of Ramadan fasting on cardiovascular risk factors: a prospective observational study." *Nutr J* 11 (2012): 1-7.

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