

Missile Fragment Embolism of the Coronary Artery in a Patient with Coronary Artery Disease

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Abstract

A 51-year-old war veteran referred to us with typical chest pain and dyspnea on exertion. He had a history of hypertension from several years before, for which he had been prescribed anti-hypertensive medications. He also gave a history of missile fragment injury to his chest from the Iran-Iraq war, for which he had been hospitalized, but had received conservative medical treatment only. After admission and initial workup, echocardiography revealed mild left ventricular dysfunction with an ejection fraction of 45%, and a metallic fragment at the diaphragmatic surface of the right ventricle. Coronary angiography showed significant stenosis at the LAD – Diagonal bifurcation, as well as a metallic fragment occluding the PDA branch of the right coronary artery. Coronary artery bypass surgery was performed successfully and the patient was discharged uneventfully. To the best of our knowledge, this is the first report of an embolized missile fragment to the coronary artery found incidentally in a patient undergoing surgery for coronary artery disease.

Keywords: Missile Fragment Embolism, Coronary Artery, Coronary Artery Bypass Surgery, Penetrating Chest Trauma.

Introduction

Missile and bullet embolism to the coronary arteries is an uncommon event and has been reported in civilian and military trauma.¹⁻⁷

Most cases present acutely with signs of cardiac tamponade and/or acute myocardial ischemia, occasionally with cardiac arrest or myocardial infarction. Late presentation or incidental finding is rare.⁸ In this report, we present a male war veteran who presented with typical chest pain and upon complete workup.

It was found he not only suffers from significant coronary artery disease but also had almost complete occlusion of the posterior descending branch of the right coronary artery, which was due to a missile fragment embolization caused by an artillery shell explosion many years ago. Interestingly, this fragment had embolized to his right coronary artery intravascularly, from the injured lung caused by the explosion. This is the first case of such a finding in a patient with coronary artery disease reported in the literature.

Case Report

Patient Description

A 51-year-old Iraqi war veteran referred to us with a complaint of typical chest pain and dyspnea on exertion. He

had a history of chest pain for over a year that had worsened during the past few months.

Case History

The patient, a retired war veteran, had a past medical history of hypertension for the past ten years, and he was presently taking anti-hypertensive medications. Also, he had a history of missile shrapnel injury to the chest during the Iran-Iraq war about twenty years previously, for which he had been hospitalized for over one month in Iraq and had received intensive medical management, including chest tube insertion and multiple blood transfusions.

Physical examination

During the physical examination, the patient had normal vital signs, including heart rate, lung auscultation, multiple shrapnel scars and chest tube insertion over the left thorax.

Routine lab tests were normal. An electrocardiogram revealed Q waves in inferior leads. The chest radiograph depicted a metallic fragment in the left chest between the inferior border of the cardiac silhouette and the left hemidiaphragm. Echocardiography revealed mild left ventricular dysfunction and a global ejection fraction of 45%, normal valve function, inferoseptal hypokinesia and a metallic fragment seen at the diaphragmatic surface of the right ventricle.

Coronary angiography was performed and showed significant stenosis at the left anterior descending (LAD) and Diagonal junction with good runoff, patent left circumflex system (LCX) with some intimal irregularity, and the metallic fragment which appeared to be located intraluminally and nearly occluding the posterior descending artery (PDA) branch of the right coronary artery (Figure 1, Figures 2 A,B).

After discussion of the patient with the hospital cardiology team, it was agreed to perform coronary artery bypass surgery as the most appropriate treatment, due to the fact that the fragment occlusion of the PDA was impossible to treat percutaneously with stenting. Furthermore, the lesion in the LAD artery at the bifurcation with the large Diagonal branch was also deemed not suitable for intervention and stenting.

The patient underwent a triple-bypass surgery procedure with an arterial graft to the LAD and saphenous vein grafts to the Diagonal and PDA branch of the RCA (distal to the fragment) successfully.

It should be noted that despite initial suspicions that this missile fragment had injured and occluded the distal right coronary artery directly by means of penetrating the chest wall, no pericardial adhesions whatsoever were present, which confirmed the embolization of the fragment to the PDA branch intravascularly. This was palpable at the operation as a firm mass within the PDA branch, with surrounding fibrotic reaction on the epicardial surface. The patient's postoperative course was uneventful and he was discharged in good health. He continues to do well after his third-year follow-up visit.

Discussion

Missile fragment embolization to the heart is a rare but well-recognized occurrence in civilian and military trauma.^{1,2} Bullet, pellet or shell fragment embolization to the pulmonary artery has been reported in the literature.^{3,4} However, these are right-sided heart emboli, and occur when a missile or shell fragment enters the venous system and return to the heart via the superior or inferior vena cava. These may ultimately lodge in the right ventricle or embolize to the pulmonary artery, and hence embolization to the left side of the heart is impossible unless there is an atrial septal defect or patent foramen ovale (paradoxical embolism). Missile fragment embolism to the coronary arteries is very

rare, and presentation is usually acute. La Vecchia et al., reported acute total occlusion of the right coronary artery due to a pellet, which resulted in inferior myocardial infarction and was treated conservatively.⁵

The case presented here is highly unusual in that it was discovered nearly twenty years after the initial injury, and presented as typical chest pain in a patient who developed coronary artery disease, the embolized shell fragment being discovered incidentally during the patient's workup.

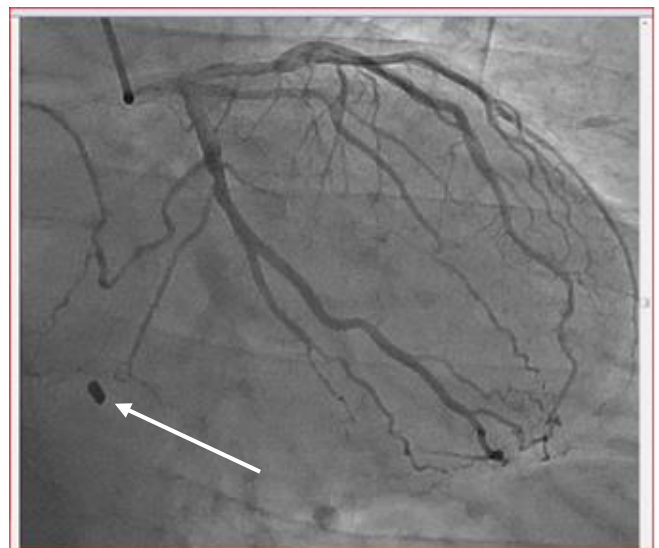


Figure-1. Coronary angiogram, right anterior oblique view depicting patent LCX system and missile fragment (arrow).

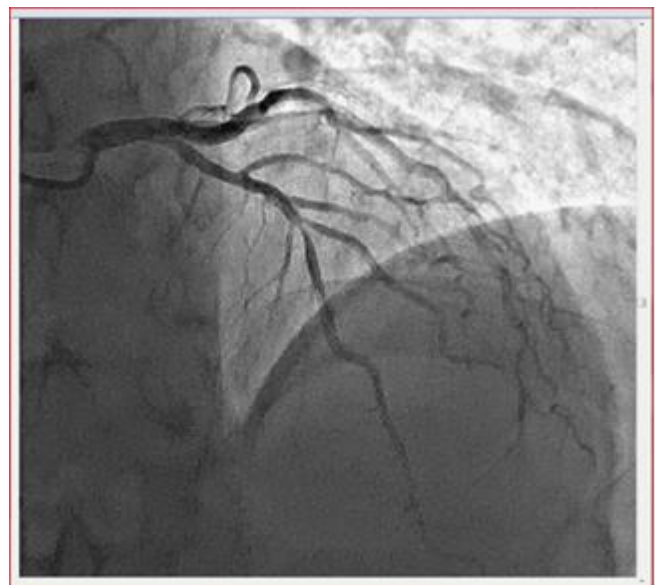


Figure-2, A. 30 degree view depicting significant stenosis at the LAD - Diagonal bifurcation.

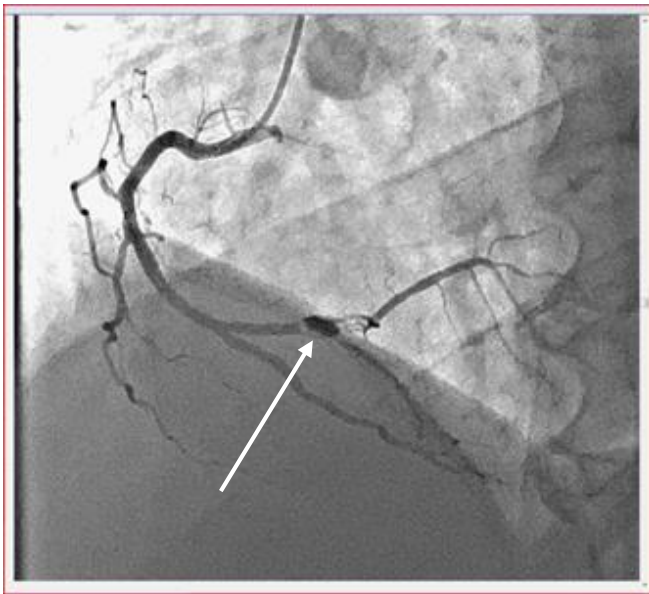


Figure-2, B. Angiogram of right coronary artery depicting shell fragment lodged in posterior descending branch and causing severe stenosis (arrow). Good distal runoff is notable

There was no medical record available regarding the hospitalization of this patient after the war injury, but we suspect that his condition was most likely stable at that time and thus there was no indication for surgery. It is not known whether the missile fragment embolized to his right coronary artery during his initial hospitalization or after that. However, it most probably was the cause for his inferior myocardial infarction with inferoseptal wall hypokinesia and depressed ventricular ejection fraction on echocardiography which was noted upon his presentation to us. Interestingly, the patient went on to develop coronary artery disease later on, and after nearly twenty years from his war injury, he referred to us with typical chest pain, leading to the incidental discovery of the embolized missile fragment in the posterior descending branch of the right coronary artery.

Furthermore, it is quite perplexing precisely how the missile fragment ended up embolizing to its location in the right coronary artery. Any arterial injury with shell fragments, despite being quite obvious at the time of injury, will embolize distally to the site of injury (away from the heart). Venous injuries with bullets, shell fragments or missile particles, if they embolize, will end up in the vena cavae and may ultimately reach the right atrium, right ventricle and finally the pulmonary artery. Paradoxical emboli may occur if there is a cardiac septal defect.⁶ However none were detected in the patient on echocardiography. This leaves the pulmonary venous system, left atrium and left ventricle as the

only remaining possible sites of entry for the embolized fragment. As there were absolutely no pericardial adhesions or any sign of external injury visible on the heart, thus effectively ruling out direct cardiac injury and entry, the most probable answer is pulmonary injury, with the fragment entering the pulmonary venous vasculature, reaching the left atrium, left ventricle, and through the aortic valve and into the right coronary artery. This is precisely the mechanism reported by Hopkins in 1993 in a multiple pellet wound patient who had a similar pellet embolism to the PDA branch of the RCA, leading to inferior myocardial infarction. However, his patient was managed conservatively.⁷ In support of this theory, our patient did report a lengthy ICU admission with chest tube insertion and massive blood loss during his initial injury and hospital admission.

Finally, although it may be argued that the patient could be a candidate for interventional treatment and percutaneous coronary intervention, it was the opinion of the cardiology team at that time with respect to the bifurcation lesion in the LAD and the nearly occluded, dominant PDA branch with good runoff, that the coronary bypass surgery would be safe and provides more complete revascularization in this relatively young and fit patient.

Although missile migration from the lung to the heart with later systemic embolization has been reported by Fisk et al.,⁸ after an extensive literature review, the author has come to the conclusion that this is the first reported case of missile fragment embolism from the lung to the heart to the coronary artery in a patient coming to surgery with coronary artery disease.

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None.

Authors' Contribution

The author pass the four criteria for authorship contribution based on the International Committee of Medical Journal Editors (ICMJE) recommendations.

Conflict of Interests

The author declared no potential conflict of interests with respect to the research, authorship, and/or publication of this article.

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