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CASE REPORT

ST-elevation myocardial infarction in a 19-year-old: a wake-up call to modifiable risk factors

David Maud[1]

Muhammad A Sajjad[1,2]

Author details can be found at the end of this article

Correspondence to:
David Maud;
David.Maud@nhs.net)

Introduction

Acute myocardial infarction accounts for more than 100 000 hospital admissions a year in the UK and is a significant contributor to the £9 billion annual healthcare-cost associated with cardiovascular disease (British Heart Foundation, 2019). Acute myocardial infarction is increasingly seen in young patients (<45 years) (Arora et al, 2019), and modifiable risk factors account for most of the presentations in this group (Yusuf et al, 2004; Lisowska et al, 2016; Shah et al, 2016). This article discusses the case of a teenager who presented with atypical symptoms and was later diagnosed and treated for ST-elevation myocardial infarction. After extensive cardiology follow up, no significant predisposing conditions were identified other than modifiable risk factors of smoking and a mildly elevated body mass index. With survival rates post-acute myocardial infarction over 70% in the UK (British Heart Foundation, 2019), this case highlights the need for healthcare professionals to refocus efforts on treating modifiable risk factors, with smoking cessation identified as a key area, to reduce the morbidity and mortality associated with acute myocardial infarction, particularly in young patients.

Case report

A 19-year-old man presented to the emergency department via ambulance after waking up with acute onset severe back and left shoulder pain. He described a similar episode of self-resolving pain a few weeks earlier, for which he did not seek medical attention. The patient had no significant past medical history and did not take any regular medications. He smoked up to five cigarettes a day with a one pack-year history. He denied any substance abuse and did not consume alcohol. His ethnicity is British-Pakistani, and he had a family history of coronary artery disease, with his grandmother and grandfather having acute myocardial infarction in their sixties and seventies respectively, although none of his first-degree relatives were affected. The patient described a recent period of emotional distress because his grandmother had experienced an acute myocardial infarction a week earlier.

On general inspection, the patient looked acutely unwell, and was clammy with tachypnoea (30 breaths per minute). He was afebrile with a normal heart rate, oxygen saturations of 94% in air and a blood pressure of 118/77 mmHg. His chest was clear and heart sounds normal, with a good range of movement in both upper limbs. An electrocardiogram was performed, demonstrating ST-elevation in the anterior leads (Figure 1), and the patient was diagnosed with ST-elevation myocardial infarction. He was given initial symptomatic treatment in the emergency department before being transferred to a specialist centre for percutaneous coronary intervention. His troponin was over 25 000 ng/litre with otherwise unremarkable bloods, apart from a raised white cell count and a mild microcytic anaemia (Table 1). At the percutaneous coronary intervention centre, he was found to have a thrombotic occlusion of the ostial segment of the left anterior descending artery and underwent an emergency aspiration thrombectomy (Figure 2). He then had primary angioplasty to the left anterior descending artery with a drug-eluting stent, resulting in the successful restoration of coronary blood flow (Figure 3). Subsequent echocardiography showed mildly impaired left ventricular systolic function with an ejection fraction of 50%.

The patient was later followed up and extensively investigated in the complex cardiology clinic, where he was treated for iron-deficiency anaemia, with no other predisposing medical conditions found. The only risks identified were a positive family history and his modifiable risk factors of smoking and an elevated body mass index of 26.8kg/m^2. There was also speculation around the role of the emotional distress of his grandmother's recent acute myocardial infarction in contributing to the presentation. He was commenced on secondary prevention pharmacotherapy and referred for cardiac rehabilitation therapy, where his main aims were to stop smoking and to increase his physical activity.

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Case report (continued)

He received inpatient smoking cessation counselling but was not prescribed a smoking cessation medication or formally referred to local services. Although he initially switched to electronic cigarettes, he has since relapsed and is smoking up to five cigarettes a day. At 18 months follow up his blood pressure, lipids and haemoglobin A_{1C} were all well controlled; he remained a smoker and his body mass index had not changed significantly.

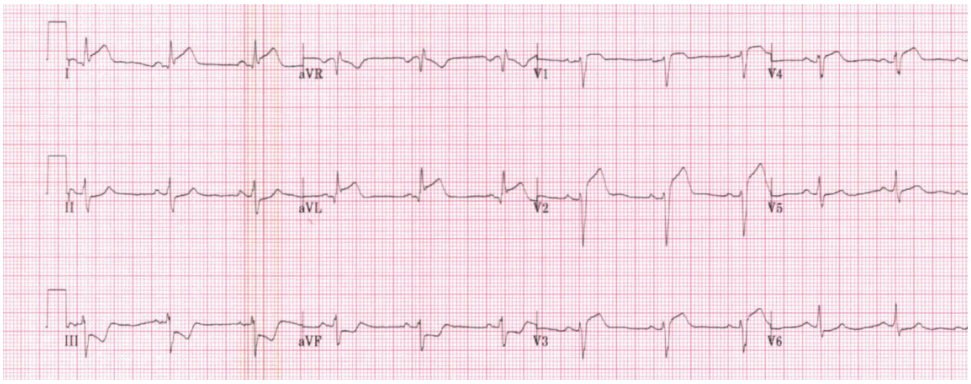

Figure 1. Initial electrocardiogram at presentation.

Table 1. Blood results from the percutaneous coronary intervention specialist centre

Test	Result	Reference range
Haemoglobin	128 g/litre	130–170 g/litre
White cell count	14.17x10^9/litre	4–11x10^9/litre
Platelets	432x10^9/litre	150–400x10^9/litre
Mean cell volume	75 fl	80–100 fl
C-reactive protein	<5 mg/litre	0–10 mg/litre
High sensitivity troponin I	>25 000 ng/litre	0–37 ng/litre
Haemoglobin A_{1c}	40 mmol/mol	<48 mmol/mol
Total cholesterol	4.1 mmol/litre	<5.0 mmol/litre

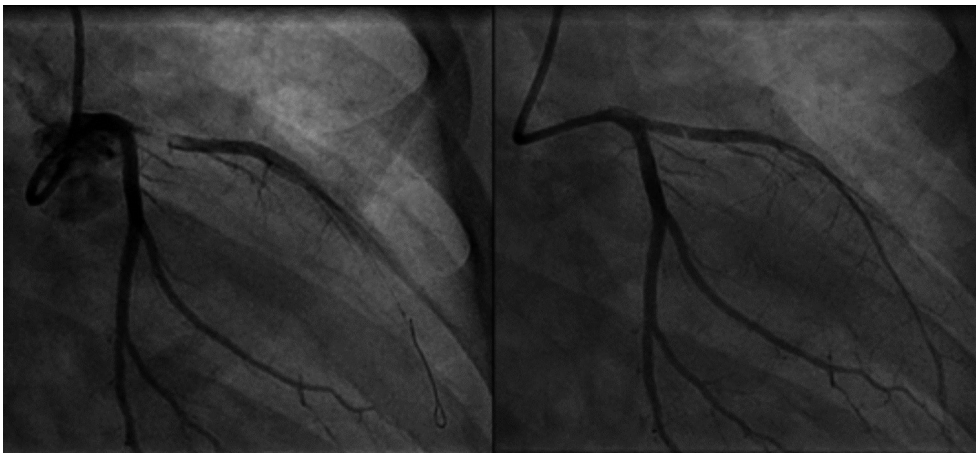

Figure 2. Angiography before and after an aspiration thrombectomy at the left anterior descending artery.

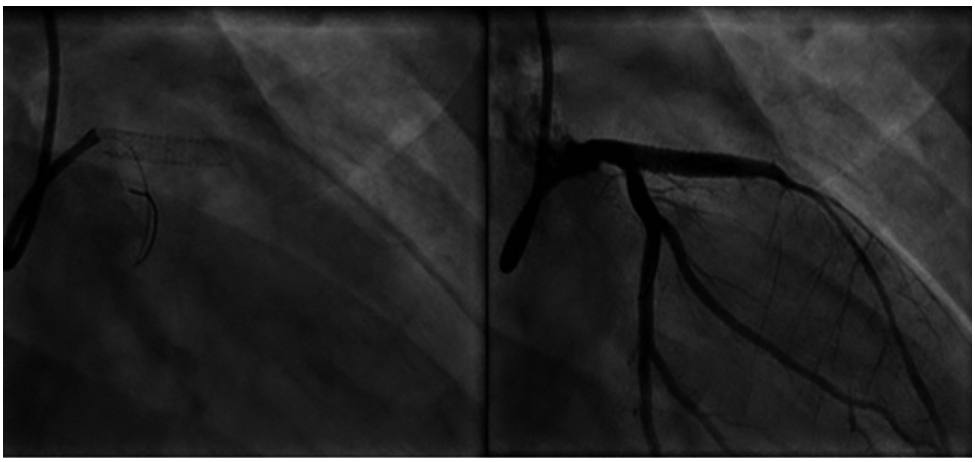

Figure 3. Angiography before and after an insertion of a stent at the left anterior descending artery.

Discussion

This case is a stark reminder that life-threatening acute myocardial infarction can be seen in young patients with very few comorbidities and may present with atypical symptoms. Furthermore, a steady increase in acute myocardial infarction in young patients (<45 years old) (Arora et al, 2019) is being seen, with studies estimating the European incidence between 2.7% and 10% of all cases (Yusuf et al, 2004; Lisowska et al, 2016).

Yusuf et al (2004) conducted a large international study, concluding that modifiable risk factors cumulatively accounted for over 90% of the population-attributed risk of an initial acute myocardial infarction in young patients, with smoking and an abnormal lipid profile identified as the strongest independent modifiable risk factors in this group (Yusuf et al, 2004; Shah et al, 2016). Smoking may be the most important modifiable risk factor as it is both fully modifiable and widespread; most patients who present with premature ST-elevation myocardial infarction are male (88%) and smokers (80%) (Ruiz Pizarro et al, 2019). Smoking is also considered the strongest independent long-term risk factor for recurrent cardiac events in young patients (Rallidis et al, 2015), and is five times more prevalent in young acute myocardial infarction patients in hospital, when compared to age- and gender-matched hospital patients with non-cardiac presentations (Shah et al, 2016). Despite this, post-acute myocardial infarction inpatient smoking cessation is an underused intervention, that has been shown to reduce mortality and to be cost-effective in similar settings (Van Spall et al, 2007; Public Health England, 2019). A patient is three times more likely to quit smoking if prescribed a smoking cessation medication in combination with expert community behavioural support than by willpower alone (Public Health England, 2019). However, although inpatient counselling rates are often high, prescriptions of smoking cessation medications are low (Van Spall et al, 2007; Lisowska et al, 2016), despite evidence that cessation rates can be doubled if action is taken during the acute illness (Black, 2010).

With more patients surviving acute myocardial infarction (British Heart Foundation, 2019), the authors suggest that smoking cessation should be identified as a priority for healthcare professionals. Increasing prescriptions of a smoking cessation medication around the time of the acute admission presents an opportunity to engage patients in smoking cessation, and targeted interventions could make an impact on both primary and secondary prevention of acute myocardial infarction in young patients.

Author details

[1]Emergency Medicine Department, Mid Yorkshire Hospitals NHS Trust, UK

[2]School of Medicine, University of Leeds, Leeds, UK

Learning points

- Acute myocardial infarction is increasing in young patients. Healthcare professionals need to be aware of atypical presentations, as well as taking all cases of severe chest pain seriously regardless of the patient's age or comorbidity status.
- Almost all premature acute myocardial infarction is preventable if modifiable risk factors are successfully treated in young patients. With survival rates increasing significantly, further work is required to treat modifiable risk factors, with the aim of both primary and secondary prevention of acute myocardial infarction.
- Smoking accounts for a large proportion of the population-attributed risk for young patients with acute myocardial infarction. Smoking should be identified as a chronic relapsing and remitting condition requiring treatment, rather than simply a lifestyle choice.
- In secondary care settings, healthcare professionals should become more familiar with, and comfortable prescribing smoking cessation medications. Giving inpatient counselling, as well as a prescription of a smoking cessation medication, has the potential to increase quitting attempts and reduce morbidity and mortality associated with acute myocardial infarction and recurrent cardiac events.
- Primary care has a role to play in identifying and targeting high risk groups at risk of acute myocardial infarction cardiovascular disease. Young male smokers warrant targeted public health interventions.

References

Arora S, Stouffer GA, Kucharska-Newton AM et al. Twenty year trends and sex differences in young adults hospitalized with acute myocardial infarction. Circulation. 2019;139(8):1047–1056. https://doi.org/10.1161/CIRCULATIONAHA.118.037137

Black JH III. Evidence base and strategies for successful smoking cessation. J Vasc Surg. 2010;51(6):1529–1537. https://doi.org/10.1016/j.jvs.2009.10.124

British Heart Foundation. UK factsheet. 2019. https://www.bhf.org.uk/what-we-do/our-research/heart-statistics (accessed 17 November 2020)

Lisowska A, Makarewicz-Wujec M, Filipiak KJ. Risk factors, prognosis, and secondary prevention of myocardial infarction in young adults in Poland. Kardiol Pol. 2016;74:1148–1153. https://doi.org/10.5603/KP.a2016.0098

Public Health England. Health matters: stopping smoking – what works? 2019. https://www.gov.uk/government/publications/health-matters-stopping-smoking-what-works/health-matters-stopping-smoking-what-works (accessed 17 November 2020)

Rallidis LS, Sakadakis EA, Tympas K et al. The impact of smoking on long-term outcome of patients with premature (≤35 years) ST-segment elevation acute myocardial infarction. Am Heart J. 2015;169:356–362. https://doi.org/10.1016/j.ahj.2014.12.003

Ruiz Pizarro V, Palacios-Rubio J, Cruz-Utrilla A et al. ST-elevation myocardial infarction in patients ≤35 years of age. Am J Cardiol. 2019;123:889–893. https://doi.org/10.1016/j.amjcard.2018.12.017

Shah N, Anne-Maree K, Cox N, Wong C, Soon K. Myocardial infarction in the "young": risk factors, presentation, management and prognosis. Heart Lung Circ. 2016;25(10):955–960. https://doi.org/10.1016/j.hlc.2016.04.015

Van Spall HGC, Chong A, Tu JV. Inpatient smoking-cessation counseling and all-cause mortality in patients with acute myocardial infarction. Am Heart J. 2007;154(2):213–220. https://doi.org/10.1016/j.ahj.2007.04.012

Yusuf S, Hawken S, Ounpuu S et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364(9438):937–952. https://doi.org/10.1016/S0140-6736%2804%2917018-9