CASE REPORT

Onset of recent exertional dyspnoea in a firefighter with left bundle-branch block

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SUMMARY

Background The presence of a left bundle-branch block (LBBB) among firefighters raises questions about stratifying risk of subsequent cardiovascular events as this conduction disorder may mask underlying coronary artery disease. This report describes the case of a firefighter with a history LBBB with exertional dyspnoea of recent onset after work activity.

Case report A 39-year-old male firefighter with LBBB developed exertional dyspnoea after a prolonged session of work. ECG and treadmill test only showed a permanent LBBB; echocardiography and myocardial scintigraphy did not add to this. However, multislice CT (MSCT) showed a significant stenosis in the mid-left anterior descending artery (LAD). Coronary angiography confirmed the stenosis with subsequent placement of a coronary stent.

Conclusions An occupational physician should take into account that factors such as age and low cardiovascular risk do not always exclude heart disease, especially when there are conduction system abnormalities that can mask possible coronary artery disease.

BACKGROUND

Firefighting is arduous and has one of the highest occupational fatality rates.¹ Surprisingly, coronary heart disease (CHD), not injury, is the number one cause of on-duty deaths among firefighters.² Firefighters have a high prevalence of CHD biological risk factors (obesity, hypertension and hyperlipidaemia).^{1–5} The presence of left bundle-branch block (LBBB) in the absence of a well-defined clinical setting raises questions and concerns about stratifying risk of cardiovascular events.⁶ An extensive cardiology evaluation is mandatory among firefighters with LBBB because they have important work-related risk factors for cardiovascular events and conduction disorders may mask underlying coronary artery disease (CAD).

CASE PRESENTATION

A 39-year-old firefighter came to our department with a history of LBBB with exertional dyspnoea of recent onset, but no other cardiological symptoms.

On the previous day he had worked for almost 4 h to extinguish a fire in a plastics factory, carrying out various activities requiring considerable physical effort. During his work he experienced exertional dyspnoea for the first time, which worsened after playing soccer in the afternoon.

ECG on admission showed QRS interval >120 ms; slurred/notched wide and predominant

R waves in leads I, aVL, V5, and V6; slurred/notched and broad S waves in V1 and V2 with absent or small R waves. The patient's heart rate was 78 bpm. Blood pressure was 120/85 mm Hg, cardiac auscultation was normal. Cardiac enzymes were normal. He reported that he had never smoked and had no family history of cardiovascular disease. His glucose level was normal. His total cholesterol was 200 mg/dL with low-density lipoprotein cholesterol of 90 mg/dL. The patient was asymptomatic during a treadmill test and exercise tolerance was >12 metabolic equivalents (METs). It showed only alterations related to the LBBB. Echocardiography at rest revealed normal regional left ventricular wall motion, a good ejection fraction (EF 60%) and no left ventricular hypertrophy or diastolic dysfunction. We decided not to perform a stress ultrasound because the acoustic window appeared inadequate. The scintigraphic examination did not identify defined areas of myocardial hypoperfusion, but exercise was terminated prior to the achievement of 85% of the age predicted maximum heart rate due to non-cardiac limitations (musculoskeletal symptoms; figure 1). Considering the type of work and the presence of exertional dyspnoea, a coronary Multislice CT (MSCT) was performed to exclude coronary disease. MSCT found a significant stenosis (>50%) in the mid-portion of the left anterior descending artery (LAD) due to a non-calcified plaque.

The patient underwent coronary angiography, which showed a 70% LAD stenosis with a fractional flow reserve (FFR) of 0.75 (figure 2).

TREATMENT

In the presence of exertional dyspnoea associated with fractional flow reserve (FFR) of 0.75 and for the partial result of scintigraphy, the cardiologist decided to place a stent in the mid-LAD.

OUTCOME AND FOLLOW-UP

At follow-up after a 6-month period of rehabilitation, the patient reported no angina and no exertional dyspnoea. His left ventricular ejection fraction was normal and exercise tolerance was >12 metabolic equivalents (METs). He returned to full-time work duties although we suggested a limitation on exposure to thermal and physical stress.

DISCUSSION

The leading cause of duty-related deaths in firefighters is sudden cardiac death (SCD). In fact, cardiovascular disease (CVD) accounts for approximately 45% of all firefighter duty-related fatalities.⁷

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Figure 1 Echocardiography showed normal regional left ventricular wall motion and a good ejection fraction (EF 60%). The scintigraphic examination did not identify defined areas of myocardial hypoperfusion.

Figure 2 Multislice CT and coronary angiography found a significant stenosis in the middle tract of the left anterior descending artery due to a non-calcified plaque with a fractional flow reserve of 0.75.

Sudden cardiac death and other CVD events (heart attacks and strokes) are most likely to occur during strenuous emergency duty associated with fire suppression.^{8 9} This increased risk arises from a multifaceted interplay of substrates and triggers, such as strenuous physical work, heat stress/dehydration and environmental conditions. However, in individuals with underlying structural CVD, the physiological responses to firefighting may lead to one or more pathological changes that greatly increase the cardiovascular risk.¹⁰

The presence of LBBB in the absence of a well-defined clinical setting raises questions and concerns about stratifying risk of subsequent cardiovascular events especially in a patient with work activities that involve stress to the cardiovascular system.¹¹ Some studies show that the mortality risk of patients with LBBB varies between 2.4% and 11% per year, compared with 1.5% to 4.4% per year in normal patients, depending on the age group.¹¹

One factor that might explain the increased mortality in patients with LBBB is related to the difficulty to identify CAD with non-invasive tests, because exercise testing is not useful with a LBBB and sensitivity of stress scintigraphy or stress echography with a LBBB is a matter of concern.¹¹ The development of new imaging modalities, such as MSCT, has facilitated the task of the physician in these cases.¹² In fact, the most recent papers show that MSCT can detect significant stenosis with a sensitivity of 91–95%, a specificity of 98–99%.^{13 14} Several studies have highlighted the possibility of a return to normal work for the type of worker in our case, after appropriate rehabilitation.¹⁵

The American National Fire Protection Agency has proposed various criteria that should be evaluated for the return-to-work

of firefighters with CHD. They are: no angina, normal left ventricular ejection fraction, no major coronary artery stenosis ($\geq 70\%$ of lumen), presence of modifiable risk factor for plaque rupture (hypertension, tobacco use, cholesterol >180 mg/dL, LDL cholesterol >100 mg/dL, or glycated haemoglobin $>7\%$), tolerance >12 METs during stress test exercise with no induced angina and no ischaemia or ventricular arrhythmia during exercise (with imaging).¹⁶ In our patient, the persistence of LBBB and the presence of cholesterol values of 185 mg/dL, after statin therapy, caused us to recommend that he avoid strenuous shift work and exposure to thermal extremes.

Learning points

- ▶ The presence of left bundle-branch block (LBBB) in the absence of a well-defined clinical setting may mask underlying coronary artery disease (CAD).
- ▶ Mortality risk of patients with LBBB varies between 2.4% and 11% per year, compared with 1.5% to 4.4% per year in normal patients.
- ▶ An extensive cardiology evaluation is mandatory among firefighters with LBBB because they have important work-related risk factors for cardiovascular events.
- ▶ The development of new imaging modalities, such as multislice CT, has facilitated the task of the physician to identify CAD with non-invasive tests in patients with LBBB.

Contributors RDR was responsible for the radiological assessment. GR was involved in the cardiological evaluation. ML worked on the rehabilitation phase and wrote the manuscript.

Competing interests None.

Patient consent Obtained.

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