alone. Peak VO₂ increased with exercise training after 3 months and remained unchanged with usual care alone. Exercise training was also associated with improvements in a physical functioning score (36-Item Short-Form Health Survey), atrial reverse remodelling and improved LV diastolic function. A large study examining the effects of exercise training in HFrEF is in progress (http://www.controlled-trials.com/ISRCTN86879094).

**Conclusion**

The accurate diagnosis and optimal pharmacological treatment of HFrEF remain challenging. Progress has been made in the understanding of the pathophysiology of this condition, and there is increasing emphasis on therapeutic strategies aimed at altering specific signalling pathways. It is critical for future clinical trials to ensure a proper characterization of the phenotype of patients to be tested. Several novel approaches appear promising in pre-clinical or early clinical studies, but need to be tested in properly designed clinical trials.

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**References**

The list of references is available in the online version of this paper.

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**CARDIOVASCULAR FLASHLIGHT**

**Inter-atrial shunt inversion by the sitting position in a patient with a patent foramen ovale and acute pulmonary embolism**

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A 67-year-old woman was admitted to our hospital because of the recent onset of dyspnoea. On hospital admission, the patient had moderate-to-severe dyspnoea and was distressed. Her peripheral blood oxygen saturation was 76% on room air when the patient was in the supine position (increasing to 88% after 12 L/min of oxygen supplementation), and 64% when she was in the sitting position, despite high flow oxygen therapy. An arterial blood gas analysis, performed in the sitting position, revealed a respiratory alkalosis with severe hypoxaemia. Her chest X-ray and computed tomography pulmonary angiography were normal. However, a ventilation-perfusion lung scanning revealed a subsegmental right acute pulmonary embolism.

An echocardiogram showed the presence of a patent foramen ovale with minimal inter-atrial left (LA) to right shunt (RA). A transoesophageal echocardiogram confirmed the presence of the foramen ovale with an inter-atrial septal aneurysm, and a minimal left-to-right shunt (Panel A, Supplementary material online, Movie S1) that became right-to-left after the Valsava manoeuvre as confirmed by the echo-contrast (Panels B and C, Supplementary material online, Movie S2), when the patient was in the supine position. Notably, positioning the patient in the sitting position, there was evidence of inter-atrial inversion of the shunt (from right to left) due to the high mobility of the huge inter-atrial septal aneurysm (Panel D, Supplementary material online, Movie S3), causing severe hypoxia.

The patient was then diagnosed with platypnoea-orthodeoxia syndrome due to an unknown patent foramen ovale and symptoms manifested by the development of right acute pulmonary embolism.

Supplementary material is available at European Heart Journal online.

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