CASE REPORT

Ventricular septal defect in a world class runner
A Boraita, J Esteve-Lanoc, M Pérez, M Rabadán, C Foster, A Lucia

We report the case of an elite male, East African endurance runner (18 years old) who ranked in the top 15 in the World Cross Country Championships (sub 21 year old category) despite having a ventricular septal defect (VSD; width: 0.22 cm) that was diagnosed 2 weeks after this event with echocardiographic evaluation. This athlete was a moderate altitude native (~3000 m). Cardiac dimensions were within normal limits and no significant pathological signs were observed. His \( V_{O2max} \) was relatively low given his performance level (67.9 ml kg\(^{-1}\) min\(^{-1}\)). Despite his limited training background (only 1 year), his running economy was, however, better than the values reported in our laboratory for Caucasian runners of the same age. Further cardiological follow up might confirm that the VSD causes no pathological effects or any performance detriment in future years.

Despite his top level performance, he had only been training seriously for about 1 year.

No cardiac risk factor was identified in his history. Cardiac auscultation evidenced a grade II/IV systolic murmur at both the cardiac apex and left sternal border. No other abnormalities were found and resting blood pressure was low at 100/60 mm Hg. Electrocardiographic (ECG) recording was compatible with the typical ECG tracing expected of the so-called “athlete’s heart”, that is, signs of early repolarisation or high T wave voltages and left ventricular (LV) hypertrophy.

Transsthoracic M-mode, two-dimensional, colour Doppler echocardiographic evaluation was performed by an experienced cardiologist, who had performed one or more echocardiographic evaluations in each of ~5000 elite athletes. A perimembranous VSD (width: 0.22 cm; length: 0.80 cm) was detected in the long parasternal axis and colour imaging revealed the occurrence of a turbulent systolic, left to right shunt through the lesion with a speed of 4.12 m s\(^{-1}\) (fig 1). Pulmonary and systemic minute volume were 6.24 and 6.25 l min\(^{-1}\), respectively. No valve abnormalities or echocardiographic signs of pulmonary hypertension were detected, although the inter-ventricular pressure gradient was 68 mm Hg and the systolic pressure of the right ventricle (RV) was close to the upper physiological limit of 35 mm Hg, that is, 32 mm Hg with a RV/LV pressure ratio of 32%. Ejection fraction was 63% and main cardiac dimensions were within normal limits and compatible with the values usually found in our centre in young elite endurance athletes: interventricular septal wall thickness at end-diastole (IVS\(_d\)): 8 mm; left ventricular end-diastolic internal diameter (LVId\(_d\)): 54 mm; right ventricular outflow tract: 29 mm; aortic root dimension: 34 mm; antero-posterior left atrial dimension (LAD): 31 mm; and longitudinal right (LRAD) and left atrial dimensions (LLAD) of 49 and 48 mm, respectively. Estimated left ventricular mass index corrected by body surface area (LVMI, in g m\(^{-2}\)) was 80 g m\(^{-2}\).

The \( V_{O2max} \) of the subject (measured in our laboratory at ~600 m altitude) was 67.9 ml kg\(^{-1}\) min\(^{-1}\), that is, below those levels reported in the best East African runners at sea level (mean of ~80 ml kg\(^{-1}\) min\(^{-1}\)) and also below the values of Caucasian (Spanish) elite runners of his same age tested in our laboratory (mean of 72.1 ml kg\(^{-1}\) min\(^{-1}\)). Nevertheless, the relatively low \( V_{O2max} \) of the subject was compensated for by a better running economy (\( V_O2 \) of 46.9, 52.3, and 54.6 ml kg\(^{-1}\) min\(^{-1}\) at 17, 19, and 21 km h\(^{-1}\), respectively) than the values usually recorded in our laboratory in Caucasian runners during gradual treadmill protocols at 1% upgrade (\( V_O2 \) of 50.7, 55.7, and 61.8 ml kg\(^{-1}\) min\(^{-1}\) at 17, 19, and 21 km h\(^{-1}\), respectively), evidencing a good adaptation to endurance running.

CASE REPORT

We report the case of an elite male, East African endurance runner (18 years old) who ranked in the top 15 in the World Cross Country Championships (sub 21 year old category) despite having a VSD that was diagnosed 2 weeks after this event, as explained below. Written informed consent was obtained from the subject in accordance with the local ethics committee.

The subject was born and raised (and has always lived and trained) in Asmara (Eritrea), at an altitude of ~3000 m. Despite his top level performance, he had only been training seriously for about 1 year.

No cardiac risk factor was identified in his history. Cardiac auscultation evidenced a grade II/IV systolic murmur at both the cardiac apex and left sternal border. No other abnormalities were found and resting blood pressure was low at 100/60 mm Hg. Electrocardiographic (ECG) recording was compatible with the typical ECG tracing expected of the so-called “athlete’s heart”, that is, signs of early repolarisation or high T wave voltages and left ventricular (LV) hypertrophy.

Transsthoracic M-mode, two-dimensional, colour Doppler echocardiographic evaluation was performed by an experienced cardiologist, who had performed one or more echocardiographic evaluations in each of ~5000 elite athletes. A perimembranous VSD (width: 0.22 cm; length: 0.80 cm) was detected in the long parasternal axis and colour imaging revealed the occurrence of a turbulent systolic, left to right shunt through the lesion with a speed of 4.12 m s\(^{-1}\) (fig 1). Pulmonary and systemic minute volume were 6.24 and 6.25 l min\(^{-1}\), respectively. No valve abnormalities or echocardiographic signs of pulmonary hypertension were detected, although the inter-ventricular pressure gradient was 68 mm Hg and the systolic pressure of the right ventricle (RV) was close to the upper physiological limit of 35 mm Hg, that is, 32 mm Hg with a RV/LV pressure ratio of 32%. Ejection fraction was 63% and main cardiac dimensions were within normal limits and compatible with the values usually found in our centre in young elite endurance athletes: interventricular septal wall thickness at end-diastole (IVS\(_d\)): 8 mm; left ventricular end-diastolic internal diameter (LVId\(_d\)): 54 mm; right ventricular outflow tract: 29 mm; aortic root dimension: 34 mm; antero-posterior left atrial dimension (LAD): 31 mm; and longitudinal right (LRAD) and left atrial dimensions (LLAD) of 49 and 48 mm, respectively. Estimated left ventricular mass index corrected by body surface area (LVMI, in g m\(^{-2}\)) was 80 g m\(^{-2}\).

The \( V_{O2max} \) of the subject (measured in our laboratory at ~600 m altitude) was 67.9 ml kg\(^{-1}\) min\(^{-1}\), that is, below those levels reported in the best East African runners at sea level (mean of ~80 ml kg\(^{-1}\) min\(^{-1}\)) and also below the values of Caucasian (Spanish) elite runners of his same age tested in our laboratory (mean of 72.1 ml kg\(^{-1}\) min\(^{-1}\)). Nevertheless, the relatively low \( V_{O2max} \) of the subject was compensated for by a better running economy (\( V_O2 \) of 46.9, 52.3, and 54.6 ml kg\(^{-1}\) min\(^{-1}\) at 17, 19, and 21 km h\(^{-1}\), respectively) than the values usually recorded in our laboratory in Caucasian runners during gradual treadmill protocols at 1% upgrade (\( V_O2 \) of 50.7, 55.7, and 61.8 ml kg\(^{-1}\) min\(^{-1}\) at 17, 19, and 21 km h\(^{-1}\), respectively), evidencing a good adaptation to endurance running.

Abbreviations: ECG, electrocardiographic; IVS\(_d\), interventricular septal wall thickness at end-diastole; LAD, left atrial dimension; LLAD, longitudinal left atrial dimension; LRAD, longitudinal right atrial dimension; LV, left ventricle; LVMI, left ventricular mass index; RV, right ventricle; VSD, ventricular septal defect

www.bjsportmed.com
We found no medical contraindication for the athlete continuing his sporting career. Nonetheless, given the lack of published data on this abnormality in elite sportsmen, a potential limitation on maximal pump capacity cannot be totally ignored in an elite, world class endurance runner. He was advised to undergo an echocardiographic evaluation on a yearly basis. Since it would be very difficult for the subject to access this type of medical follow up in his country of origin, due to lack of economic resources and sports cardiology/medicine centres, he was invited to be evaluated in our centre during his future visits to our country and to stay in contact with us or with other cardiologists.

What is already known in the topic
No report is available on the occurrence of ventricular septal defects in elite athletes. Furthermore, this type of lesion is very rare in adults (non-athletes) of western countries.

What this study adds
A ventricular septal defect is reported for the first time in a top level, East African runner. Although this lesion does not seem to have impaired his athletic performance so far, further cardiac follow up is necessary in the future.

Accepted 29 November 2004

REFERENCES
Ventricular septal defect in a world class runner

A Boraita, J Esteve-Lanao, M Pérez, M Rabadán, C Foster and A Lucia

doi: 10.1136/bjsm.2004.016071

Updated information and services can be found at:
http://bjsm.bmj.com/content/39/7/e32

These include:

References
This article cites 5 articles, 1 of which you can access for free at:
http://bjsm.bmj.com/content/39/7/e32#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/