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Chest Pain as Leading Symptom of an Atrial Septal Defect

Brustschmerzen als führendes Symptom eines Vorhofseptumdefekts

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Summary

- › **In the context of her check up for sports eligibility**, an 11-year-old professional female gymnast reported a retrosternal pain during high intensity parts of the fitness training.
- › **The physical examination** revealed a 2/6 systolic murmur in the second left intercostal space without radiation and a fixed splitting of the second heart sound. Resting ECG showed right heart overload with right axis deviation, incomplete right bundle branch block as well as terminal negative T-waves in V1-V3. Transthoracic echocardiography revealed a relevant atrial septal defect (ASD) of secundum type with a left to right shunt and consecutive right heart overload. This finding could be confirmed both angiographically and by means of transoesophageal echocardiography. Due to the size of the defect and the lack of sufficient caudal septal rim, transcatheter closure with implantation of an Amplatzer Septal Occluder could not be successfully performed. Thus, the indication was given for a surgical repair of the ASD which was performed with direct suture closure (primary closure). The postoperative course was uneventful.
- › **No signs of chest pain were noticed** after resumption of her usual training in the same intensity. Isolated chest pain during exercise is an unusual leading symptom in ASD patients and should always be clarified with cardiac imaging.
- › **Based on this case report**, the important role of the resting ECG and echocardiography in the setting of preparticipation screening can be emphasized.

Zusammenfassung

- › **Eine 11 Jahre alte leistungssportlich aktive Turnerin** berichtete im Rahmen ihrer sportmedizinischen Tauglichkeitsuntersuchung über retrosternale Schmerzen ohne Ausstrahlung, die nur bei hochintensiven Belastungen während eines Fitnesstrainings bzw. beim Tennisspielen auftraten.
- › **Die körperliche Untersuchung** ergab ein 2/6 Systolikum im 2. ICR links ohne Fortleitung sowie einen gespaltenen 2. Herzton. Elektrokardiographisch zeigten sich Rechtsherzbelastungszeichen im Sinne eines Rechtstyps/inkompletten Rechtsschenkelblocks sowie terminale T-Negativierungen in V1-V3 mit Aufrichten von V3 während der ausbelastend durchgeführten Fahrradergometrie. In der transthorakalen Echokardiographie konnte ein Vorhofseptumdefekt (ASD) vom Secundumtyp mit einem Links-Rechts-Shunt und konsekutiver Volumenbelastung der rechten Herzhöhlen nachgewiesen werden. Dieser Befund konnte sowohl angiographisch als auch mittels transösophagealer Echokardiographie bestätigt werden. Ein interventioneller Verschluss mittels Amplatzer Septal Occluder war jedoch aufgrund der Größe des Defektes und des gering ausgebildeten kaudalen Septumrandes nicht möglich. Es bestand somit die Indikation für einen kardiochirurgischen ASD-Verschluss, der mittels Direktnaht komplikationslos durchgeführt wurde. Der postoperative Verlauf gestaltete sich komplikationslos.
- › **Nach Wiederaufnahme ihres Trainings** konnte die Sportlerin auch hohe Intensitätsbereiche beschwerdefrei absolvieren. Isoliert auftretende belastungsabhängige thorakale Schmerzen als führendes Beschwerdebild sind ungewöhnlich für Patienten mit einem Vorhofseptumdefekt und sollten immer mit kardialer Bildgebung weiterführend abgeklärt werden.
- › **Anhand dieses Fallbeispiels** zeigt sich der wichtige Stellenwert des Ruhe-EKGs und der Echokardiographie im Rahmen von Sporttauglichkeitsuntersuchungen.

KEY WORDS:

Thoracic Pain, ASD, Echocardiography, Sports Eligibility

SCHLÜSSELWÖRTER:

Thorakale Schmerzen, ASD, Echokardiographie, Sporttauglichkeit



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Introduction

An 11-year-old professional female gymnast came for a routine check up for sports eligibility. The athlete had competed on an elite level for 3 years with specialist disciplines bars and floor. The training volume was 5 times per week and each training session lasted 3 hours. In addition, the gymnast played recreationally tennis. Half a year ago,

a fitness program was introduced which was perceived as physically very exerting by the gymnast. During the intermittent high intensity parts of the fitness training, the gymnast described a retrosternal pain, which lasted for several minutes and aggravated when training continued. After a couple of minutes in rest, the chest pain disappeared.

The same symptoms occurred during intense tennis matches. Further symptoms such as shortness of breath, palpitations, tachycardia, dizziness and syncope were not apparent. A loss of performance or increasing fatigue did not occur. No previous concerns were identified through her personal history and the medical family history of underlying heart disease was negative.

The gymnast did not report taking medication or prohibited substances.

Examinations

The physical examination revealed a fixed splitting of the second heart sound and a 2/6 systolic murmur in the second left intercostal space. Resting blood pressure (both upper extremities) was 115/80 mmHg.

Resting 12-lead electrocardiogram (ECG) showed a sinus rhythm with a heart rate of 80/min, right axis deviation (115°), a first-degree AV block (PQ 0,22 ms), an incomplete right bundle branch block as well as terminal negative T-waves in V1-V3. During exercise testing on a cycle ergometer (stepwise incremental test protocol starting at 25 W and increasing every 3 min by 25 W until voluntary exhaustion) the T-wave in V3 became positive from the second step onwards. No chest pain occurred during the incremental cycling test up to exhaustion. The maximum power output was normal in regard to the sport discipline. Transthoracic echocardiography revealed a large atrial septal defect (ASD) of secundum type with a left to right shunt. The right atrium and right ventricle were dilated as well as the pulmonary artery trunk but there was no evidence for pulmonary hypertension. There was no indication of a patent ductus arteriosus, an aortic isthmus stenosis or an anomalous origin of a coronary artery.

The presence of the ASD in secundum position with a left to right shunt was confirmed by means of angiography and transoesophageal echocardiography (fig. 1). The measurement of the ASD with a Sizing-Balloon-Catheter showed a diameter of 23mm (fig. 2). Furthermore, due to the history of chest pain during physical activity, a coronary angiography as well as a left ventricular angiography was performed by a pediatric cardiologist. The course of the coronary arteries was normal, there were no stenosis or myocardial bridging. To exclude structural myocardial diseases, cardiac magnetic resonance (CMR) imaging with late enhancement was performed (fig. 3). CMR revealed no evidence for a myocarditis or a hypertrophic (obstructive) cardiomyopathy. The right ventricular enddiastolic volume (RVEDV) was measured as 121ml, the right ventricular endsystolic volume (RVESV) as 71 ml, corresponding to a right ventricular ejection fraction (RV-EF) of 41%.

Therapy

As therapeutic intervention, an implantation of a commercial closure device (Amplatzer Septal Occluder) was performed. However, stable position of the device was not possible due to the size of the defect and the lack of sufficient aortal rim. Thus, the interventional closure was not considered appropriate and the indication was made for a surgical repair of the ASD. Successful direct suture closure (primary closure) of the ASD was performed.

The gymnast tolerated the surgery well. Her postoperative course was uneventful; the postoperative echo demonstrated good ventricular function and no signs of residual defects or pericardial effusion. After resumption of her usual training in the same intensity, no signs of chest pain could be noticed. These findings were confirmed by repeated exercise testing



Figure 1

Transoesophageal echocardiography showing a significant left to right shunt through the ASD with oval shape without septal aortal rim. LA, left atrium; RA, right atrium.

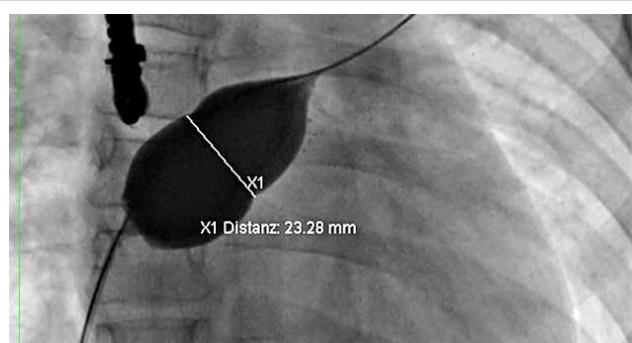


Figure 2

Sizing-Balloon-Catheter showing an ASD-diameter of 23mm.

which revealed no sign of any symptoms under maximal physical performance.

Discussion

ASDs account for 7 to 10 percent of all congenital cardiac malformations and lead to left to right shunt depending on the defect size and hemodynamic conditions (1). In this report, we are presenting a case of a young professional female gymnast with chest pain as leading symptom of a previously undiagnosed large ASD of secundum type. Isolated chest pain during exercise is an unusual leading symptom in ASD patients as the most common symptoms are dyspnea on exertion and fatigue due to the hemodynamically relevant left to right shunt (1,4).

In this case, the chest pain under exercise may be caused by the diminished left ventricular output and became only apparent when an extremely higher oxygen demand was required during high intensity parts of the training. Surprisingly, no exercise intolerance in the form of exertional dyspnea or fatigue occurred while performing high-intensity training. It is known that the functional capacity of patients with ASDs is substantially impaired due to a significant left to right shunt with right ventricular volume overload, altered left ventricular relaxation and diminished effective left ventricular forward flow (2,4).

Therefore, patients with a significant ASD should be offered elective closure soon after the diagnosis is established, irrespective of age.

According to the recommendations of the European Society of Cardiology (ESC) for competitive sport participation >

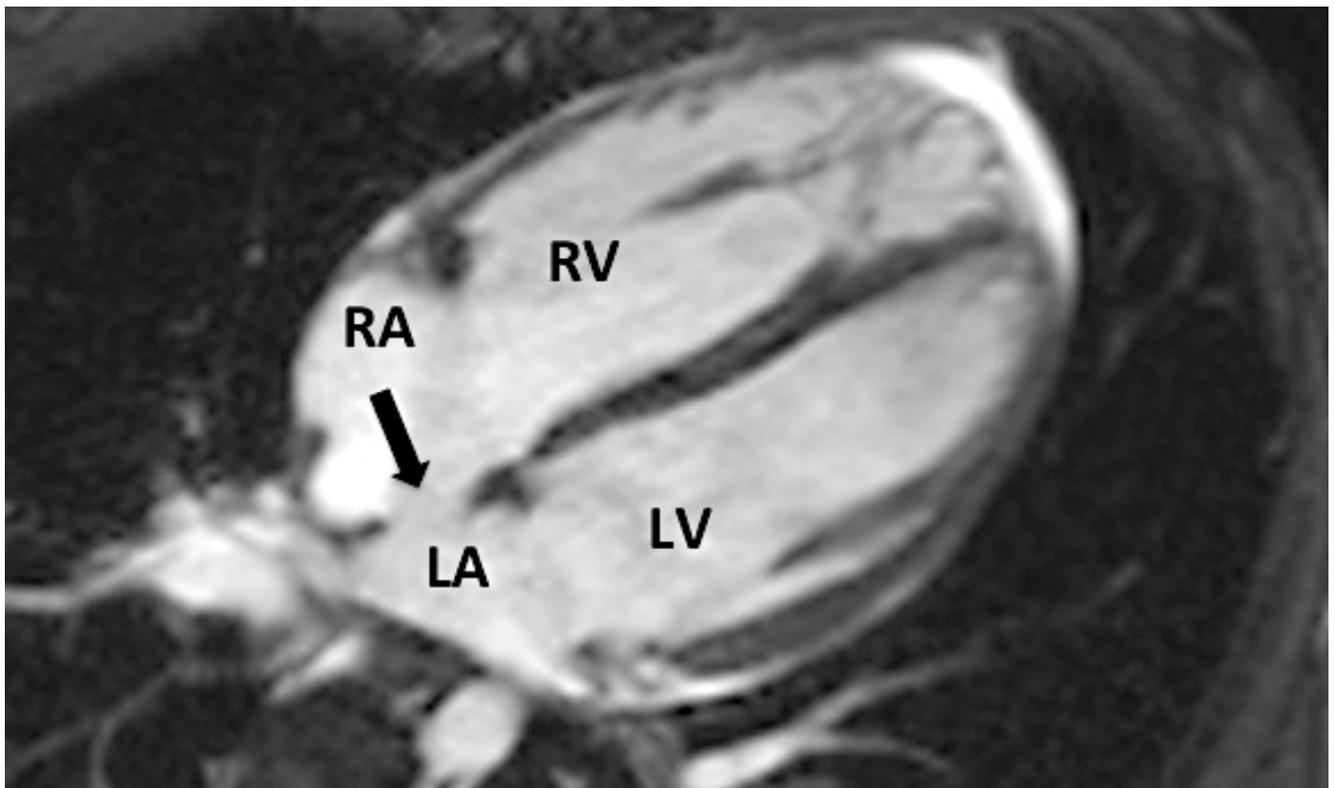


Figure 3

CMR imaging showing the ASD in a four chamber view with a dilated right ventricle. LV, left ventricle; RV, right ventricle.

in athletes with ASD, criteria for sports eligibility include a defect < 6mm of size, or 6 months post-closure with normal pulmonary artery pressure and no significant arrhythmia or ventricular dysfunction (3).

When screening examinations in young athletes are performed, special care should be taken upon the physical examination. Hearing a systolic ejection murmur at the upper left sternal border or a diastolic rumble at the lower left sternal border as well as a fixed splitting of the second heart sound may be a sign that an ASD is present. The resting ECG may show right atrial overload, a rightward QRS axis, incomplete right bundle-branch block and voltage evidence of right ventricular hypertrophy.

The most important noninvasive diagnostic tool is transthoracic echocardiography that documents the type and size of the ASD, the direction of the shunt and the functional importance of the defect. In conclusion, our case report underlines the value of screening tools such as resting ECG and echocardiography in the context of preparticipation screening. ■

Conflict of Interest

The authors have no conflict of interest

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