Lower cardiac index and increased pulmonary backflow during exercise in adults with small unrepaired Atrial Septal Defects – an MRI study

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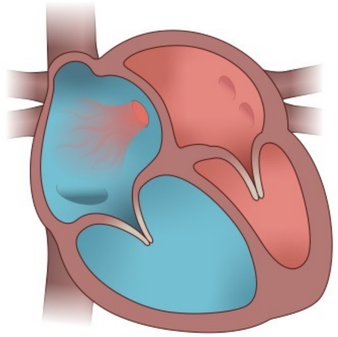
Background

A small, unrepaired atrial septal defect (ASD) is considered a benign lesion with good prognosis. Recently, clinical and register-based studies discovered increased long-term mortality and morbidity as well as impaired functional capacity in adults with small unrepaired ASDs when compared with their healthy peers.



The nature of these findings is not fully understood and therefore, magnetic resonance imaging (MRI) was performed to evaluate cardiac function at rest and during exercise.

Aim

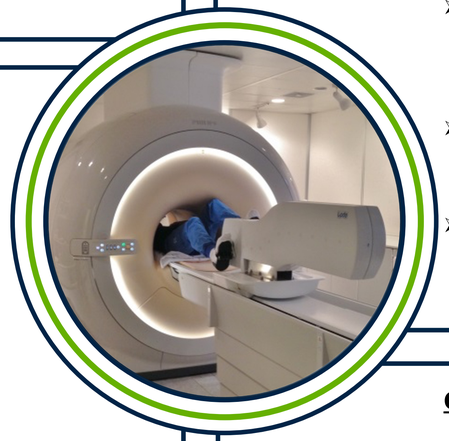
Examine atrial and ventricular volumes, morphology, and function at rest and during exercise in patients with small, unrepaired ASD's using MRI scans

Method

- 15 open ASDs (39±11years).
- 15 matched controls (38±12years).

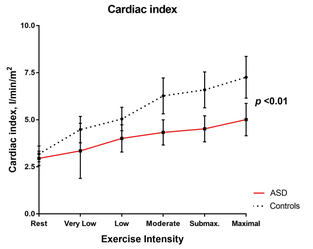
- 20 spontaneously closed ASDs (36±13years).
- 20 matched controls (36±11years).

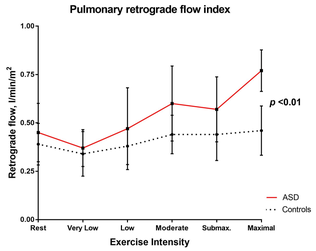
- Cardiac MRI:
  - Cine scans for chamber volume and morphology evaluation
  - Quantitative flow scans measured blood flow in the systemic and pulmonary circulation at rest and during increasing supine exercise.



Results

- Cardiac chamber volumes and flow measurements at rest were comparable between groups.
- Heart rates and workloads were comparable between groups during exercise.
- Shunt ratio for open ASDs was 1.2±0.2 and remained unchanged during exercise. Absolute blood flow through the shunt increased from rest (0.9±0.9l/min) to exercise (2.1±1.8l/min).
- Open ASDs had a lower exercise capacity of 31% and had higher retrograde flow through pulmonary artery during exercise compared with controls.
- Closed ASDs had a lower exercise capacity of 18% (*p=0.02)* but no change in retrograde flow through pulmonary artery during exercise compared with controls.





Conclusion

Adults with a small, open ASD (Qp/Qs=1.2) exhibit a markedly lower exercise capacity of 31% compared with their healthy peers. Furthermore, patients with open ASDs exhibit higher retrograde flow with increasing exercise compared with healthy controls. These findings may partly explain the lower functional capacity demonstrated previously. Still, the causes of the increased long-term morbidity in ASD patients remain undetermined and further research is warranted.

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