

## [Limited Ventricular Preload is the Main Reason for Reduced Stress Reserve after Atrial Baffle Repair.](#)

Eicken A, Michel J, Hager A, Tanase D, Kaemmerer H, Cleuziou J, Hess J, Ewert P.

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### Take Home Points:

- This study showed significant difference in preload reserve between atrial switch patients and normal controls via hemodynamic study in multiple conditions.
- During catheterization, both groups were studied at baseline, after a volume bolus, with atrial pacing, and with dobutamine
- Atrial switch patients had a *decrease* in stroke volume compared to baseline, even at the relatively low rate of 80 beats per minute
- Patients with severely depressed systemic right ventricular function had severely depressed functional reserve and significantly reduced augmentation of cardiac output with dobutamine
- Systemic vascular resistance is higher in patients with atrial switch than normal controls

**Commentary from Dr. W. Aaron Kay (Indianapolis), section editor of ACHD Journal Watch:** The atrial switch procedure, although it has been abandoned in favor of the arterial switch procedure, still has a large number of adult survivors throughout the world. Indeed, it was recently demonstrated that the atrial switch procedure is still performed in 30% of cases worldwide for transposition of the great arteries. Although about 10% of patients have severe RV dysfunction and require transplantation, a large portion of survivors of the Mustard and Senning procedures have minimal symptoms and good quality of life, but in many cases, have limited exercise tolerance. The exact reasons for this are not well known, and many hypotheses have been presented.

This study from Germany sought to explore the hypothesis that patients after atrial switch have inadequate preload reserve and thus cannot augment systemic blood flow under conditions of higher stress. The fixed preload is thought to be due to stiff, poorly compliant, atrial baffles, as well as adverse interaction between the pressures in the pulmonary venous atrium versus the systemic venous atrium.

In this study, 49 patients with Mustard or Senning who were having hemodynamic evaluation underwent additional testing under different conditions: baseline (resting), after an intravenous volume bolus, with atrial pacing at 80 bpm, and with dobutamine infusion. The control group consisted of a much older population who were referred for PFO closer and who consented to have additional hemodynamic measurement under the same conditions after PFO closure. The control group was significantly older than the atrial switch group (~42 years versus ~23 years).

The authors found that, even though over half of the atrial switch patients were NYHA class I, that there was a significantly lower baseline cardiac index in the atrial switch patients versus controls (2.2 LPM/m<sup>2</sup> versus 2.6 LPM/m<sup>2</sup>). There was no difference in heart rate response under different conditions between atrial switch group and normal controls. The cardiac index increased under all conditions, but increased by a smaller amount in the atrial switch group. Interestingly, the stroke volume *decreased* from baseline after atrial pacing in the atrial switch group, even though the pacing rate was relatively low at 80 bpm. The exact mechanisms for this observation are unfortunately not further explored in this study. Of note, Redington et al performed a similar study in 1990, albeit with

only 3 pediatric patients who had undergone the Mustard procedure, in which a lack of contractile reserve after Mustard was demonstrated (**Br Heart J 1990;63:45-9**).

Both a severely depressed right ventricular function and presence of severe tricuspid regurgitation were associated with significant lack of functional reserve with dobutamine infusion. The authors performed a secondary analysis excluding those with severely depressed systolic function and were still able to show evidence of significant inability to augment preload in the remaining subjects. Systemic vascular resistance was found to be higher in the atrial switch group. Administration of volume, pacing, and dobutamine decreased SVR in both groups; however, the reduction in SVR after dobutamine was significantly lower in the atrial switch group than in normal controls.

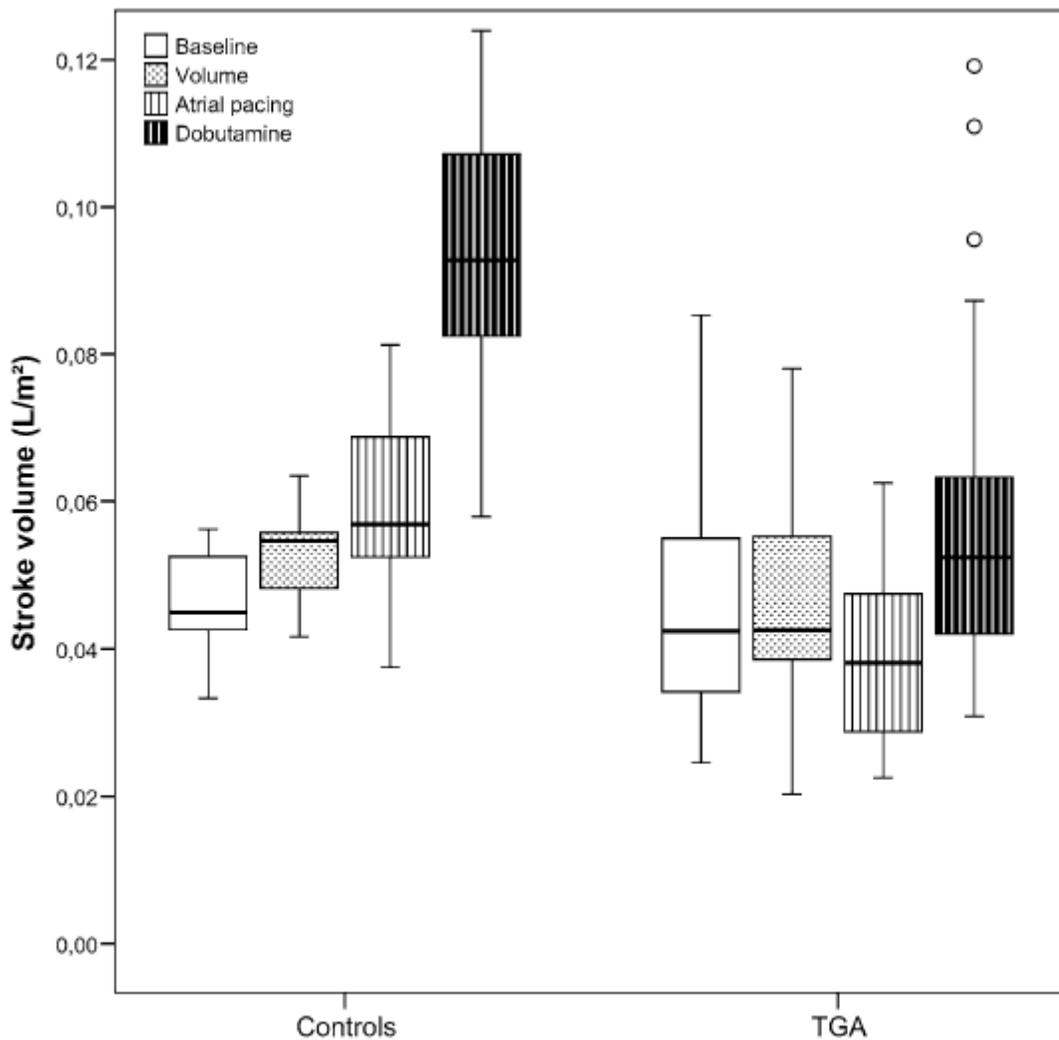


Fig. 2 Indexed stroke volume (l/m<sup>2</sup>) at baseline, volume, pacing, dobutamine, in 49 patients with TGA after ABR and in 10 controls box plots express median, 25 and 75% quartiles, minimum, maximum and outliers ([1.5 interquartile length values])