



Atrioventricular conduction recovery immediately after the re-operation in a repaired CHD patient

Brief Report


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Abstract

This is a case of a 2.7-year-old girl with trisomy 21 and double outlet right ventricle who underwent epicardial pacemaker system placement for a surgical atrioventricular block and achieved atrioventricular conduction recovery immediately after residual ventricular septal defect closure. Although ventricular pacing ratio was 100% before re-operation, it declined to approximately 25% on the 6th post-operative day and was <1% 3 years after re-operation.

Approximately 12 to 63% of patients with surgical atrioventricular block after CHD repair recover their atrioventricular conduction;^{1,2} however, a majority of these recoveries are observed during the early post-operative period or in patients with a transient atrioventricular block.^{2,3}

We report a rare case of atrioventricular conduction recovery immediately after residual ventricular septal defect closure 8 months after the initial repair.

Case

A 2.7-year-old girl, weighing 11.7 kg, with trisomy 21, Fallot type double outflow right ventricle, and a history of left modified Blalock-Taussig shunt, underwent pulmonary valve-sparing repair, which was complicated with a dense complete atrioventricular block. On the 15th post-operative day, a permanent epicardial pacemaker system (Azure XT DR MRI, Medtronic, Minneapolis, MN) was implanted and set with a rate-adaptive atrioventricular delay; however, the patient was completely dependent on ventricular pacing. Moreover, she was found to have a residual ventricular septal defect of 10 × 8 mm in diameter between the superior portion of the ventricular septal defect patch and the anterior limb of the trabecula septomarginalis (Fig. 1A), which subsequently caused persistent pulmonary hypertension and left ventricular enlargement. She did not gain weight, and her brain natriuretic peptide level elevated to 291 pg/mL. Hence, residual ventricular septal defect closure was indicated 8 months after the initial repair.

During the re-operation, the residual ventricular septal defect was closed with an expanded polytetrafluoroethylene patch and multiple pledgetted interrupted sutures through the previously placed right ventricular outflow tract patch (Fig. 1B). No maneuver was added to the inferior portion of the ventricular septal defect patch or tricuspid valve. On the 6th post-operative day, while conducting a regular pacemaker check, atrioventricular conduction recovery was noted with a ventricular pacing ratio of 24.5%. Because the ventricular pacing ratio increased to 94.6% again due to suspicion of ventricular pacing fusion at 1 month post-operatively, the pacing mode was switched to the managed ventricular pacing mode to reduce unnecessary ventricular pacing. A reduction in the ventricular pacing ratio to 25.4 and 1% and an increase in the sinus rhythm pattern to 60.6 and 90.2% at 1 and 3 years after the re-operation, respectively, was achieved owing to the change in pacing mode (Fig. 2). Normalisation of the brain natriuretic peptide level was observed, and all cardiopulmonary-related medications were discontinued 2.6 years after re-operation (Fig. 2).

Discussion

Of the patients who suffer from a complete atrioventricular block following CHD repair, approximately 40% require permanent pacemaker implantation post-operatively.⁴ Risk factors for the requirement of a permanent pacemaker include large or peri-membranous ventricular septal defect with inlet extension.⁵ Although atrioventricular conduction recovery is occasionally observed during the early post-operative period,² recovery late after surgery or immediately after re-operation, as observed in our case, is rare. Recovery immediately after re-operation could be attributed to haemodynamic improvement or reduction of tension to the previously placed ventricular septal defect patch anchored close to the conduction system.

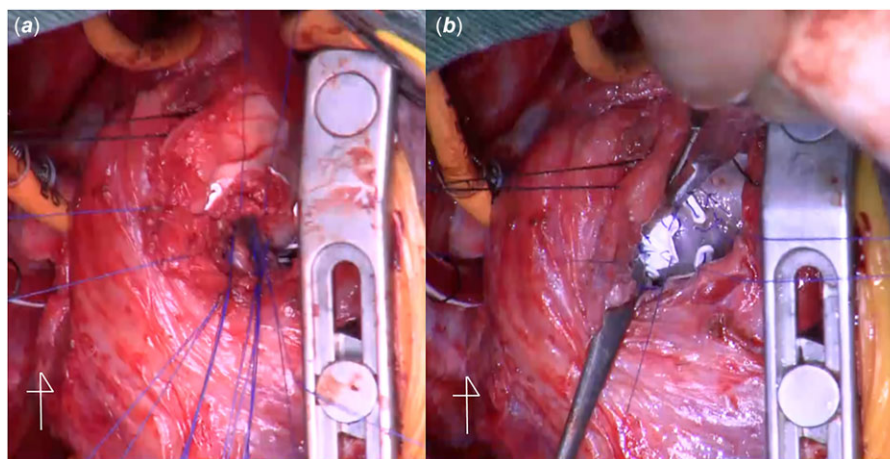


Figure 1. Intra-operative photos demonstrating A) residual ventricular septal defect confirmed between the superior portion of the previously placed patch and the anterior limb of trabecula septomarginalis through the right ventricular outflow tract incision and B) residual defect closed with an expanded polytetrafluoroethylene patch and pledgetted interrupted sutures.

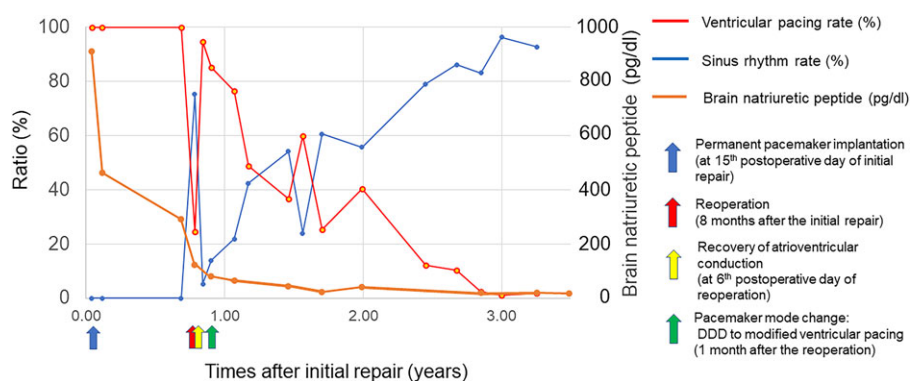


Figure 2. Transition of the heart rhythm and brain natriuretic peptide level after the initial repair.

Even after full recovery of atrioventricular conduction was achieved, pacemaker removal could be deemed too aggressive, because a relapse into a complete atrioventricular block after recovery to normal atrioventricular conduction has also been reported.¹ In our case, the change in the pacing mode yielded a positive impact in promoting atrioventricular conduction recovery, reducing ventricular pacing, and preparing for relapse.

Conclusion

We report a rare case of recovery from surgical atrioventricular block immediately after re-operation. We found that closing the haemodynamically significant residual ventricular septal defect is important for the recovery of atrioventricular conduction. Furthermore, the pacing mode change was effective in promoting the recovery of atrioventricular conduction.

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