

The outcome of patients with functional single ventricle after pacemaker implantation—what makes it poor and what can we do?

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Introduction

In the patients with functional single ventricle, it is known that the risks of death and several kinds of complications are high, both before and after the Fontan procedure. Permanent pacemaker implantation for bradyarrhythmia is one of the factors related with poor outcome. However, the detailed mechanism is not fully recognized.

Methods

A retrospective chart review of patients with single ventricle who have undergone permanent pacemaker implantation at Fukuoka Children's Hospital was performed. The patients were categorized into three groups, according to the existence of a ventricular lead and the frequency of ventricular pacing: Group A, 11 patients with pacemaker with atrial lead only; Group B, 12 patients with ventricular lead and ventricular pacing rate <50%; Group C, 15 patients with ventricular lead and ventricular pacing rate >50%. Group C was subsequently divided into two subgroups, according to the location of the ventricular lead, as the 7 patients with apical ventricular pacing lead and 8 patients with non-apical ventricular pacing lead for further analysis. In all cases, the pacing leads were epicardial leads.

Results

Groups A and B did not have any mortality, whereas group C had survival rates of 58.9% and 39.3% after 10 and 20 years, respectively, of pacemaker implantation. Among the post-Fontan patients, there was no difference among the three groups in terms of ejection fraction and proportion of atrioventricular valvular regurgitation. The BNP (brain natriuretic peptide) significantly increased according to the frequency of ventricular pacing at 11.7, 20.3, and 28.4 pg/ml for groups A, B, and C ($p = 0.04$). In Group C, the outcomes did not show significant difference between two subgroups. However, the BNP was significantly lower in post-Fontan patients with ventricular apical pacing lead than in those with non-apical pacing lead (27.0 pg/ml vs. 82.8 pg/ml, $p = 0.03$).

Conclusions

A higher frequency of ventricular pacing was related with poor outcome and higher BNP, probably implying the association with ventricular dyssynchrony. The apex was the optimal site of an epicardial ventricular lead for patients with functional single ventricle.