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Case Report

Supravalvular thrombus after pulmonary artery banding and fontan procedure evaluated by multidetector-row computed tomography

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Summary The mechanisms responsible for thromboembolic events in children with congenital heart disease have not yet been fully elucidated. Furthermore, establishment of long-term anticoagulation therapy in Fontan patients remains controversial. Here, we report the case of a 9-year-old boy who presented with hemiparesis due to a thromboembolic stroke; the boy had previously undergone staged pulmonary artery banding and Fontan procedure. Cardiac multidetector-row computed tomography (MDCT) clearly showed the supravalvular thrombus at the roofed (blind) pulmonary valve and circulatory stasis, which could be considered a possible source of the thrombus. Follow-up CT examination showed that the thrombus disappeared, but the circulatory stasis remained. Therefore, because the risk of thrombus formation was not eliminated, anticoagulation therapy was continued for the patient. Our case indicates the possible application of cardiac MDCT for providing insight into the hemodynamic mechanisms responsible for the thromboembolic events in children with congenital heart disease.

Introduction

Thromboembolic complication is one of the major factors contributing to late morbidity and prognosis in children with congenital heart disease after Fontan procedure [1—4]. Several researchers have investigated the mechanism of thrombus formation [5], but it is difficult to identify the

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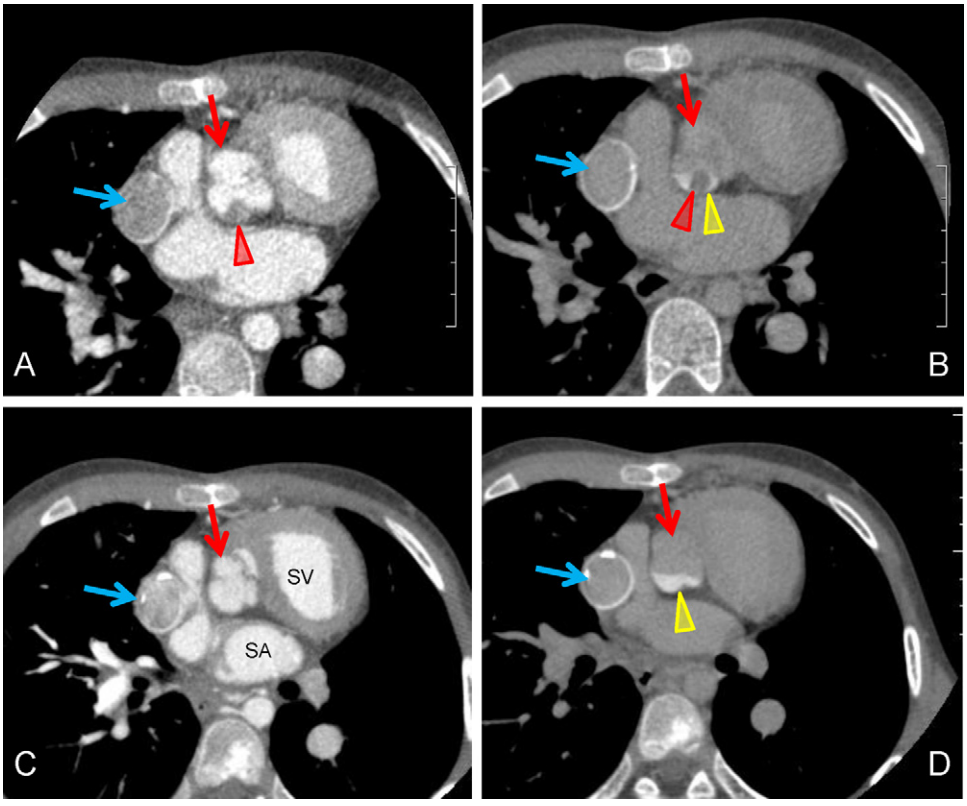

Figure 1 Cardiac multidetector-row computed tomography axial images show serial changes in the thrombus at the roofed (blind) pulmonary valve (red arrow) and the total cavo-pulmonary connection (blue arrow) of the Fontan procedure in the initial and follow-up examinations. The upper panels (A and B) clearly describe the thrombus (red arrowhead) at the roofed (blind) pulmonary valve. The lower panels (C and D) show the thrombus, which remains as a negative contrast in the iodine contrast medium (the fluid—fluid level, yellow arrowhead), implying possible circulatory stasis. SA, single atrium; SV, single ventricle. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

thromboembolic source because of the complex cardiac anatomy.

Cardiac multidetector-row computed tomography (MDCT) can provide a three-dimensional view of the cardiac anatomy with high spatial resolution. Recently, clinical application of cardiac MDCT has been expanded from adult cardiology to pediatric cardiology.

Case report

A 9-year-old boy was referred to a local hospital because of sudden onset of left hemiparesis. He was diagnosed with thromboembolic stroke by means of magnetic resonance imaging and admitted to an intensive care unit. Four days after the thromboembolic event, his neurological deficits improved, and he was transferred to our hospital. His medical history included the following: diagnosis of a single atrium and single ventricle and total anomaly of pulmonary venous drainage (TAPVD) at birth, followed by a series of complex cardiac surgeries; pulmonary artery banding (at 3 months); bidirectional Glenn procedure combined with ligation of the vertical vein and common pulmonary vein to atrium anastomosis (at 2 years); and total cavo-pulmonary connection (TCPC) of Fontan procedure (at 3 years).

For systemic workup of his complex cardiac anatomy, cardiac MDCT (Brilliance iCT, Philips Healthcare, Cleveland, OH, USA) was performed. Early images (retrospective ECG-triggering, 80 kV, 585 mAs; effective dose: 6.1 mSv) clearly revealed a supravalvular thrombus at the roofed (blind) pulmonary valve and the TCPC conduit as a contrast defect (Fig. 1A). Late images (prospective electrocardiogram-triggering, 80 kV, 180 mAs; effective dose: 1.8 mSv) also depicted the negative contrast-enhanced thrombus surrounding the iodine contrast described as the fluid—fluid level and the well-enhanced TCPC conduit without mural thrombus (Fig. 1B). Considering the possibility that the source of the thromboembolic event was not eliminated, anticoagulation therapy was continued. Six months later, a follow-up cardiac MDCT was performed, which showed that the thrombus disappeared, but the congestion of the iodine contrast, i.e. circulatory stasis, remained (Fig. 1C and D).

Discussion

Previous studies have shown that thromboembolic events after Fontan procedure are not rare and range from 3% to 16% [1—4]. Jacobs and Pourmoghadam reported that thromboembolism after Fontan procedure is attributed to various