SURGICAL MANAGEMENT OF ACTIVE INFECTIVE ENDOCARDITIS IN A PREMATURE NEONATE WEIGHING 950 GRAMS

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Despite the improvement in medical treatment of patients with active infective endocarditis, surgical management remains a challenge, in particular for premature babies with very low birth weight.^{1,2} Herein we report the case of a premature neonate with active infective endocarditis refractory to antibiotic treatment, weighing 950 g, who was referred to us for surgical treatment.

Clinical summary. As a result of premature membrane rupture, a female neonate was born at 25 weeks of gestation weighing 750 g. Delivery was normal, and the Apgar scores were 4 at 1 minute and 5 at 5 minutes. Mechanical ventilation was required because of severe respiratory distress. The electroencephalogram showed no abnormalities, but the transfontanellar echocardiogram showed a subependymal hemorrhage.

Connatal pulmonary infection was suspected and antibiotic treatment was started through a central venous line placed in the right side of the heart. After 1 week of therapy, blood culture revealed a *Candida albicans* infection. Antibiotic therapy was changed to fluconazole and after 10 days to amphotericin B. A cardiac murmur appeared and the cross-sectional echocardiogram demonstrated a cardiac mass localized inside the right ventricle (from the apex to the outflow

Fig 1. Parasternal short-axis view (slightly rotated) showing the vegetation in the right ventricle protruding through the pulmonary valve. *Vegetación*, Vegetation; *VD*, right ventricle; *AO*, aorta; *APT*, pulmonary artery; *Val*, valve.

tract), protruding through the pulmonary valve and causing valvular obstruction (Fig 1).

The diagnosis of active infective endocarditis caused by mycotic thrombus was established. Because of the high risk of complete pulmonary valve obstruction with potentially sudden death, the patient was referred for surgical treatment on an emergency basis. At the time of the operation she was 6 weeks old and weighed approximately 950 g. The operation was performed through a median sternotomy. A hollow-fiber membrane oxygenator (Safe Micro HF Oxygenator, Polystan A/S, Vaerlose, Denmark) without an arterial line filter was used. Standard techniques of neonatal cardiopulmonary bypass (CPB) were used. However, because of the small size of the patient, some changes had to be made. The circuit was

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primed with 150 mL of whole fresh leukocyte-depleted blood; the hematocrit value achieved was 37%. For aortic cannulation, an 8F cannula (Medtronic DLP, Medtronic Inc, Walker, Mich) was inserted in the ascending aorta. For venous drainage, instead of standard venous cannulas, two 8F 23-cm trocar thoracic catheters (Argyle, Sherwood Medical, St Louis, Mo) were used. CPB was conducted at normothermia and flow rates of 198 mL/min were used. Without aortic crossclamping and after the 2 cavae were snared, a right atriotomy was performed and the vegetation was completely removed through the tricuspid valve. After a total CPB time of 26 minutes and without hemofiltration, the patient was weaned without inotropic drugs. The postoperative management was according to our standard postoperative protocol used for neonates after cardiac surgery. Only low-dose dopamine and diuretics were necessary until extubation (4 days after the operation). Ventilation was accomplished with the ServoVentilator 900 C (Siemens-Elema AB, Solna, Sweden) with a tidal volume of 10 mL/kg and a respiratory rate of 35 breaths/min. While the infant was intubated, sedation and analgesia were accomplished with intermittent boluses of fentanyl or midazolam, according to the patient's need. Culture of operative biopsy material revealed *C albicans*. Postoperative antibiotic treatment with amphotericin B was continued for 4 weeks. Eight days after the operation, the patient was transferred to her original hospital in good condition and made an uneventful recovery.

Discussion. Although infective endocarditis is relatively uncommon during infancy, the disease is more prevalent in small babies because of more frequent invasive, diagnostic, and therapeutic procedures.¹ The indications for and timing of surgery in patients with active infective endocarditis present major therapeutic problems and challenges, especially for premature babies with very low birth weight.^{1,2} Nevertheless, if active infective endocarditis is refractory to antibiotic treatment, surgery must not be delayed. The infective process can produce more extensive involvement and endocardial and myocardial destruction, necessitating more important debridement and complex reconstruction.¹ In our case report, the operation was performed on an emergency basis because of the high risk of sudden death, owing to the location of the mycotic thrombus. Previously, we¹ described a similar patient requiring surgery at 11 months, in whom the predisposing factor for infective endocarditis was also a central venous line placed in the right side of the heart. Intracavitary foreign materials in cardiac chambers are frequent predisposing factors for endocarditis in infancy, often associated with *C albicans*.¹ However, this neonate represented a particular challenge because of her prematurity and low

weight. Despite the presumption that these babies are too weak to withstand CPB, with the additional risk of intracranial bleeding, some reports suggest good results in the repair of congenital heart defects in premature low-birth-weight babies.²⁻⁴ The advances made in CPB procedures and the understanding of perfusion in small bodies have improved outcomes in neonatal cardiac surgery. Because of the small size of these patients and the immaturity of pulmonary and other organ systems, making fluid management difficult, some changes had to be made in the standard CPB technique. The priming volume was reduced as much as possible (an arterial line filter was not used). As the surgical procedure was simple, ultrafiltration was avoided to reduce CPB time. Whole fresh leukocyte-depleted blood was used to prime the circuit in an effort to attenuate the inflammatory response after CPB.⁵ Venous cannulas had to be adapted to the small size and fragility of the vessels to avoid a low venous return flow.

Regarding the risk of perioperative intracerebral hemorrhage, the reports about the incidence of major neurologic complications in these patients are controversial.^{3,4} Nevertheless, our patient, who had a preoperative subependymal hemorrhage, did not have neurologic complications after CPB. Despite the relatively low incidence of infective endocarditis in pediatric patients, it is an important complication during infancy. We believe that the excellent outcome in our case validates the principle of early surgery in premature, low-weight infants with active infective endocarditis refractory to medical treatment, since surgery is potentially lifesaving.

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