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CASE REPORT

Surgery for Infective Endocarditis with Aortic Valve Damage in Children: A Case Report and Literature Review

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Objective: To summarize the experience of surgical treatment and perioperative management of a case of infective endocarditis with aortic valve damage in a child with congenital heart disease.

Methods: We retrospectively analyzed the treatment of a pediatric patient with infective endocarditis combined with aortic valve damage, who was admitted to the Department of Cardiovascular Surgery of our hospital in Yinchuan in March 2024. We summarize the case data and present a literature review.

Results: The child recovered well after surgery, with echocardiographic re-examination, mild regurgitation of the aortic valve, and no recurrence of endocarditis. She recovered and was discharged from hospital.

Conclusion: The surgical treatment of infective endocarditis in children has achieved satisfactory results, and the timing of and indications for surgery are very important to achieve the therapeutic effect.

Keywords: infective endocarditis, congenital heart disease, cardiac surgical procedures, child

Infective endocarditis (IE) refers to the inflammation of the cardiac valves or ventricular endocardium caused by microbial infection by microorganisms such as bacteria and fungi. Its characteristic pathological injury is the formation of vegetations. IE in children is a relatively rare but serious infectious disease, which is caused by endocardial inflammation due to pathogenic microorganism infection. The vegetation often invades the heart valve, causing different degrees of valve function damage, and even causing cardiac insufficiency, affecting the prognosis in children.[1] Embolism, especially cerebral embolism, is one of the serious complications of IE, which often leads to poor prognosis. A previous report suggests that vegetations ≥10 mm increase the incidence of IE embolic events and mortality.[2]

If congenital heart disease (CHD) combined with IE is not detected or is not properly treated in time, it will cause serious complications, with a high mortality rate. The mortality rate of CHD combined with IE is 4–10%, with a hospital fatality rate as high as 15–20%. This combination seriously threatens the life and health of patients;[3] however, timely surgical treatment can reduce mortality rates.

This report summarizes the experience of surgical treatment and perioperative management of a child diagnosed with IE with aortic valve damage in the Department of Cardiovascular Surgery of our hospital. The child, female, 9 years old, was admitted to the hospital for "intermittent fever for more than one month, chest tightness, palpitations, abdominal distension with lower extremity edema for 3 days" on March 12, 2024. The child had developed a fever after catching a cold one month earlier, with the highest temperature of 39.5°C. After taking antipyretic medicine, the temperature dropped to normal. During this period, she had fever intermittently and did not go to the hospital for treatment. In the 3 days prior to hospitalization, the child had experienced palpitations, chest tightness, and occasionally pain and discomfort in the praecordia, with abdominal distension, double lower limb edema, depression, and poor appetite, and was brought to our emergency department. She had previously been in good physical health. Upon physical examination, there was no

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cyanosis in the lips, no filling of jugular vein, and the heart boundary expanded to the left with no abnormal bulges or depressions. The apical beat was 0.5 cm outside the fifth intercostal midline of the left clavicle, and the heart rate was 153 bpm, with a regular rhythm. A continuous murmur could be heard between the left sternal margin and the second and third intercostals. The abdomen was soft, the liver was not palpable, there was no tenderness, and the bowel sounds were normal. Mild edema was present in both lower extremities. Preoperative blood culture determined the causative agent to be *Streptococcus mitis*. The echocardiography report demonstrated CHD, aortic right coronary sinus tumor rupture, aortic valve vegetation, aortic valve insufficiency (moderate), aortic right coronary valve prolapse and moderate regurgitation, and tricuspid valve vegetation. The left heart function was normal and the left ventricular ejection fraction (LVEF) was 51.20%.

The diagnoses upon admission were aortic sinus aneurysm rupture (aortic sinus aneurysm had broken into the atrium dextrum), IE, endocarditis with aortic valve perforation, aortic valve vegetation, aortic valve insufficiency (moderate), tricuspid valve vegetation, tricuspid insufficiency, cardiac insufficiency, bacteremia, anemia, and hypoproteinemia.

After admission, the child was treated with ampicillin sodium and linezolid; however, the intermittent fever, cardiac insufficiency, abdominal distension, and lower limb edema were not relieved, and she underwent surgical treatment. Surgery comprised aortic sinus aneurysm rupture repair, removal of aortic valve and tricuspid valve vegetations, aortic valvuloplasty, and tricuspid valvuloplasty with cardiopulmonary bypass.

Surgical exploration showed an aortic sinus aneurysm into the atrium dextrum, with rupture of about 10 mm, brittle margins, vegetation formation, destruction of tricuspid valve infection, regurgitation (moderate to severe), right coronary valve vegetation, and destruction of the right coronary valve leaflet at the left and right coronary valve junction. The main surgical methods were as follows. The sinus aneurysm margin and tricuspid septal vegetation were removed, and an appropriately sized bovine pericardial piece was continuously sutured to repair the aortic sinus aneurysm rupture. A right pericardial piece was cut, the right crown leaflet was reconstructed, and aortic valvuloplasty was performed. Echocardiography showed mild aortic insufficiency and mild insufficiency of the tricuspid valve. Ampicillin combined with linezolid was given for anti-infection treatment after the operation.

The child had postoperative complications such as hepatic impairment, decreased albumin, and acute renal failure. Therefore, she was transferred to the intensive care unit of cardiac surgery after the operation, and was treated with drugs and continuous renal replacement therapy. She had normal urine output on the 7th postoperative day and her liver and kidney function had recovered. On the 7th postoperative day, the blood culture was negative. The child recovered and was discharged, and anti-infection treatment was continued outside the hospital, with regular follow-up. The perioperative clinical data of the patient are shown in Table 1. Preoperative echocardiography, intraoperative vegetation, and postoperative echocardiography are shown in Figure 1.

IE is a dangerous and lethal illness with high mortality rates.[4] The most common pathogens in children with IE are viridans streptococci and *Staphylococcus aureus*, which account for at least 80% of positive blood cultures. Owing to the presence of cardiac malformation in IE complicated with CHD, surgery is an effective treatment method, and mastering the timing of the operation, and therefore actively creating surgical conditions, is the key to treatment. Based on the relevant literature,[5] it is believed that surgical treatment should be carried out when the following conditions occur: 1) cardiac insufficiency; 2) congestive heart failure combined with left heart function impairment; 3) right ventricular association with left ventricular IE; 4) vegetation diameter greater than 10 mm; 5) echocardiography revealed aortic valve and mitral valve vegetation, or the vegetation caused valve stenosis or incomplete closure; 6) systemic circulation embolism or pulmonary embolism; however, 4 weeks after cerebral hemorrhage complications, such as cerebral hemorrhage caused by cerebral infarction, may be the best time for surgery; 7) the aorta is involved, and a pseudoaneurysm has developed; 8) periaortic abscess formation with atrioventricular block; 9) moderate regurgitation above the valve; 10) paravalvular leak or paravalvular abscess; 11) valve perforation caused by paravalvular infection; 12) the infection cannot be controlled; and/or 13) infection caused by drug-resistant bacteria or fungi.

It is very important for children with CHD complicated with IE to receive an early, sufficient dosage, full course of anti-infective treatment. Postoperative anti-infection treatment reports in the literature make the following

Table 1 Perioperative Clinical Indicators of the Child

Item	Preoperative	1st Postoperative day	7th Postoperative day	Discharge from Hospital
Leucocyte count (*10^9/L)	16.32	25.98	15.10	7.15
Neutrophil count (*10^9/L)	10.41	21.92	11.92	4.96
Neutrophil relative values (%)	63.9	84.3	78.9	69.4
Procalcitonin (ng/mL)	2.0	22	6.5	0.5
Hemoglobin (g/L)	90.0	100.0	109.0	103.0
Platelet count (*10^9/L)	178.0	138.0	150.0	149.0
Aspartate aminotransferase (U/L)	56.1	350.8	25.4	22.8
Alanine aminotransferase (U/L)	51.1	91.5	48.2	19.7
Blood albumin (g/L)	31.5	24.7	35.4	33.3
Urea (mmol/L)	8.76	25.02	8.94	12.40
Creatinine (μmol/L)	45.0	247.7	145.0	73.5
Urinary volume at 24 hours (mL)	550	85	536	680
Glomerular filtration rate (mL/min*1.73 m^2)	198.68	25.27	48.28	109.79
NT-proBNP (pg/mL)	10,100.00	>30,000.00	6,620.00	1,980.00
LVEF (%)	51.20	48.30	58.72	62.40

recommendations:[6,7] on the basis of surgery, if the blood or intraoperative neoplasm culture is positive, intravenous sensitive antibiotics should be administered until at least 4–6 weeks after negative blood culture; if the blood or intraoperative neoplasm culture is negative, intravenous antibiotics can be applied for 4–6 weeks; and for fungal endocarditis or prosthetic valve implantation, the postoperative intravenous antibiotic therapy should be extended for another 2–4 weeks.

There are still some limitations in the diagnosis and treatment of children with CHD combined with IE. Early diagnosis, and reasonable use of antibiotics combined with early surgery, can achieve good therapeutic results. The clinical signs of and pathogens involved in CHD with IE show a trend of diversification. It is important to analyze the clinical characteristics, pathogens, and drug resistance of IE patients to create surgical conditions as soon as possible, to facilitate the diagnosis and treatment of CHD with IE.

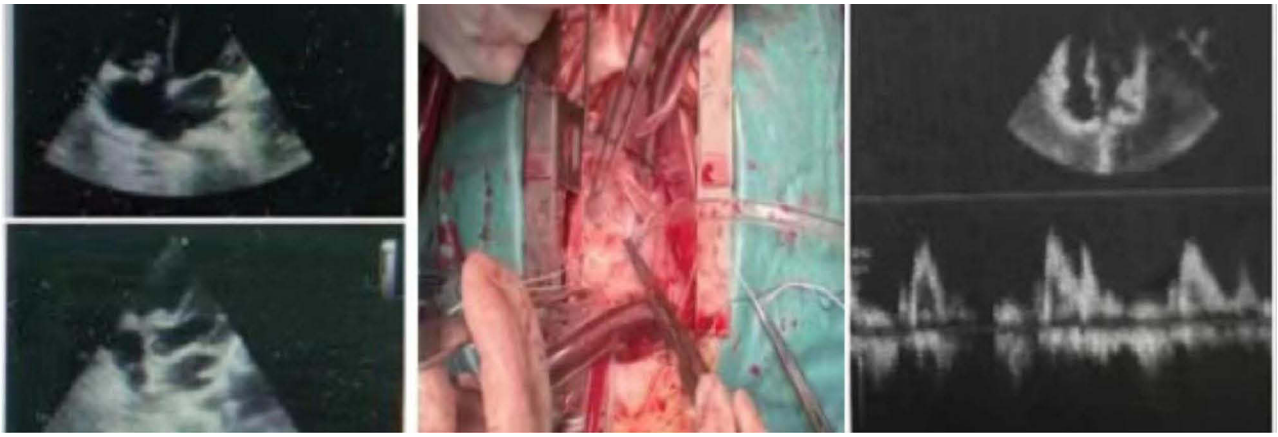

Figure 1 Preoperative cardiac ultrasound, intraoperative vegetation, and postoperative cardiac ultrasound of the child.

Abbreviations

CHD, congenital heart disease; IE, infective endocarditis; LVEF, left ventricular ejection fraction.

Consent to Participate Statement

This study was conducted with approval from the Ethics Committee of General Hospital of Ningxia Medical University. The patient's legal guardian provided informed consent for the case details and images to be published.

Disclosure

The authors declare that they have no competing interests.

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