

# İNFEKTİF ENDOKARDİT SAPTANAN ÇOCUKLARDA KLİNİK, LABORATUVAR VE EKOKARDİYOGRFİK PARAMETRELERİN RETROSPEKTİF DEĞERLENDİRİLMESİ

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## ÖZ

**AMAÇ:** İnfektif endokardit (İE) konjenital kalp hastalığı olan çocuklarda nadir görülen bir enfeksiyondur. Bu çalışmanın amacı hastalığın erken tanı ve tedavisinde klinik şüphenin önemini ortaya koymaktır.

**Metod:** Çalışmaya Ocak 2003-Temmuz 2005 tarihleri arasında infektif endokardit şüphesi olan yaşları 8 ay-14 yaş (ortalama 4.2±0.9) olan 28 hasta alındı. Hastalar Duke kriterleri kullanılarak değerlendirildi. Klinik ve laboratuvar bulguları, kan kültürleri ve ekokardiyografik değerlendirmeleri retrospektif olarak yapıldı. Hiçbir hastaya öncesinde dental veya cerrahi girişim uygulanmamıştı.

**Bulgular:** Hastalarımızdan %14.3'ünün kültürlerinde koagülaz (+) staphylococcus aureus üretti. Duke kriterleri kullanılarak, sadece %14.2 hastada kesin infektif endokardit, diğerlerinde olası infektif endokardit tespit edildi.

**Tartışma-Sonuç:** Duke kriterleri bazı hastaların tanısında anlamlıdır. İnfektif endokardit erken tanı ve tedavisinde en önemli basamak klinik şüphedir.

**Anahtar kelimeler:** İnfektif Endokardit, Duke Kriterleri.

## RETROSPECTIVE EVALUATION OF CLINICAL, LABORATORY, AND ECHOCARDIOGRAPHIC PARAMETERS OF INFECTIVE ENDOCARDITIS IN CHILDREN

### ABSTRACT

**Purpose:** Infective endocarditis (IE) is a rare infection in children with congenital heart disease. The aim of this study was to define clinical suspicion as the most important criterion for its early diagnosis and treatment.

**Method:** Patients aged 8 months-14 years (mean 4.2±0.9) supposed to have infective endocarditis between January 2003 and July 2005 were included in the study. They were analyzed using the Duke criteria. Clinical and laboratory results, blood cultures, and echocardiographic findings were evaluated retrospectively. None of the patients had undergone dental or surgical procedures.

**Results:** In our series, 14.3% of the cultures were positive for coagulase positive Staphylococcus aureus. Using the Duke criteria, only 14.2% patients had definite IE, while the others had possible IE.

**Conclusion:** The Duke criteria for the diagnosis of IE are relevant only for some patients. Clinical suspicion must be the most important step in the early diagnosis and treatment.

**Key Words:** Infective Endocarditis, Duke Criteria.

## INTRODUCTION

Infective endocarditis (IE) is an uncommon infection in children with congenital heart disease. Although it is relatively rare in children, its incidence has been reported to be increasing.<sup>1</sup> Significant morbidity and mortality are associated with the disease, in spite of improvements in diagnosis and antimicrobial treatment.<sup>2</sup> The epidemiology of heart disease in children has changed during the past decades.<sup>3,4</sup> Because of the increased survival rate of children with congenital heart disease in developed countries and the increase in rheumatic valvular heart disease in developing countries IE has become a great risk.<sup>1</sup> Classically, Streptococcus spp. have been the main causative microorganisms of IE, but in recent years Staphylococcus aureus has been detected more frequently due to congenital heart disease surgery.<sup>3,4</sup> The diagnosis is based on the Duke criteria.<sup>5</sup> After echocardiography was incorporated into the diagnostic criteria, culture negative IE has also been recognized as an important subset.<sup>6</sup> In this report, we reviewed the epidemiology, clinical features, and management of IE in a single pediatric cardiology unit.

## METHODS

All hospital admission records of 1338 patients at Dr. Behçet Uz Childrens' Hospital in İzmir were retrospectively analyzed between January 2003 and July 2005 using the Duke criteria and were reviewed for clinical presentation, blood cultures, laboratory results, group agglutination tests, pathological specimen culturing and echocardiographic findings.

The data are presented as age, gender, predisposing factors (congenital heart disease or rheumatic heart disease), affected valves, causative microorganisms, treatment, and outcome.

Renal insufficiency was defined as a serum creatinine concentration >130 mol/L. Neurologic abnormalities were defined as clinical signs of cortical and subcortical lesions, consciousness, and meningitis.

## STATISTICAL ANALYSIS:

Data analysis was performed using SPSS for Windows version 11.0 (SPSS Inc., Chicago, Illinois, USA) using Student's t-test, with p<0.05 being statistically significant.

## RESULTS

The records of 18,743 patients admitted to the children's hospital's pediatric cardiology unit between January 2003 and July 2005 were reviewed. Of the 1338 records of pediatric cardiology inpatients reviewed, 28 admitted with the diagnosis of IE were evaluated in this study (2.1%). The characteristics of the patients are shown in Table 1. There were 18 boys and

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10 girls, ranging in age from 8 months and 14 years. None of the patients had undergone any dental or cardiac/other surgical procedure. The predisposing heart diseases of the patients are summarized in Table 2. The clinical presentations of the children are listed in Table 3. Seventeen patients had congestive heart failure, while 10 patients referred with fever had only septicemia, without heart failure. Six patients had echocardiographic right-sided vegetations, and 1 patient had myocardial abscess formation. None of the patients showed symptoms of renal failure or neurologic abnormalities.

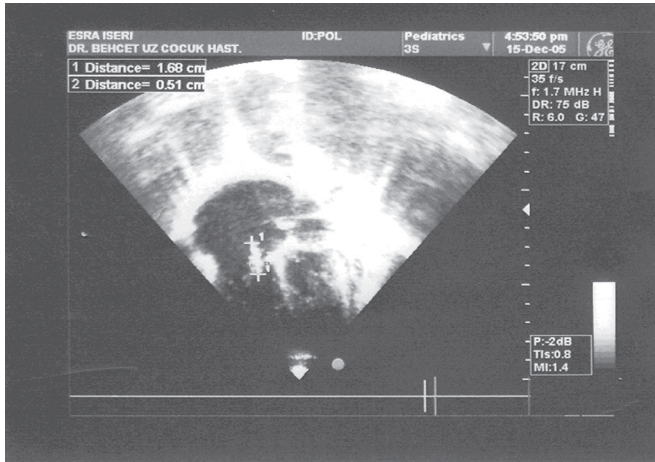


Figure: Right-Sided Infective Endocarditis

**Table 1:** Demographic characteristics of patients with endocarditis

Demographic data	Patients (n=28)
Age (years)	4.2 ± 0.9 years
Gender	18 boys, 10 girls
Predisposing factor (CHD)	25
Predisposing factor (RHD)	3
Follow-up Period (mean)	5 months
Poor Dental Hygiene	5
Fever Duration (mean)	2 weeks

CHD: Congenital heart disease RHD:Rheumatic heart disease

**Table 2:** The congenital and acquired heart diseases of children

	n	%
<b>Rheumatic heart disease</b>	3	11
Congenital heart disease	25	89
Ventricular septal defect (VSD)	6	21
Tetralogy of Fallot (TOF)	4	14
TOF-Blalock Taussig Shunt	3	11
Pulmonary valvar stenosis	3	11
Ventricular septal defect, pulmonary stenosis	2	7.1
Patent ductus arteriosus (PDA)	2	7.1
Atrioventricular septal defect	1	3.5
Tricuspid atresia and PDA	1	3.5
VSD-Aortic Coarctation	1	3.5
Double outlet right ventricle, PDA dextrotransposition,	1	3.5
Aortic valvar stenosis	1	3.5
<b>TOTAL</b>	<b>28</b>	

**Table 3:** Clinical presentation of children

	n	%
Congestive heart failure	17	60.71
Septicemia	10	35.71
Peripheral embolization (right sided)	1	3.5
Neurologic abnormalities	0	0
<b>TOTAL</b>	<b>28</b>	

The laboratory findings are shown in Table 4 and blood culture results in Table 5. Mean Hb level was 10.4 g/dl, WBC count 16,280/mm<sup>3</sup>, platelet count 412,000/mm<sup>3</sup>, sedimentation rate 48 mm/h, CRP 6.7 mg/dl, C3 90 mg/dl, and RF 10.2 IU/ml. The blood cultures showed that *Streptococcus viridans* and *Staphylococcus aureus* were the most common organisms

The criteria for infective endocarditis are shown in Table 6.

**Table 4:** The laboratory findings

Data	Mean	Min.	Max.
Hemoglobin (g/dl)	10.4	9.8	11.2
White blood count (mm <sup>3</sup> )	16,280	13,000	25,000
Thrombocyte count (mm <sup>3</sup> )	412,000	380,000	620,000
Erythrocyte sedimentation rate (mm/h)	48	40	85
C-reactive protein	6.7	5.6	10.5
C3 (mg/dl)	90	60	100
RF (IU/ml)	10.2	9.5	11

**Table 5:** The results of blood culture

Microorganism	n
Streptococcus viridans	1 0
Coag (-) Staph. aureus	5
MSSA	3
MRSA	1
E. coli	3
Brucella	2
Klebsiella pneumonia	1
Moraxella catarrhalis	1
Micrococcus crista	1
Pseudomonas aeruginosa	1
<b>TOTAL</b>	<b>2 8</b>

MSSA: Methicillin sensitive *Staphylococcus aureus*  
MRSA: Methicillin resistant *Staphylococcus aureus*

**Table 6:** The features of positive Duke criteria in the patients

Duke criteria	Patients (n)
Fever (>38 °C)	28
Positive blood culture	28
Immunologic phenomena (rheumatic factor positivity)	18
Predisposing factor (CHD)	24
Predisposing factor (RHD)	3
Vegetation	6
Abscess formation	1
Vascular phenomena (septic pulmonary infarcts)	1

All patients were initially administered penicillin and amikacin, when they were first suspected to have infective endocarditis, usually within the first 3 days of hospitalization. Following the results of blood cultures, the patients were all treated according to the antibiograms for a total of at least 4 weeks. One patient underwent surgery during the treatment because of lung embolization, five patients underwent surgery after 2 weeks of antimicrobial treatment, one with intractable heart failure, two with vegetations bigger than 8 mm, and two with brucella endocarditis, who were treated with doxycycline (200 mg/24 h), gentamicin (5 mg/kg/24 h), and rifampin (5 mg/kg/24 h) for 6 months.

## DISCUSSION

IE occurs less commonly in children than in adults, and tends to occur more frequently in children with congenital heart disease.<sup>7</sup> Our incidence of IE is similar to that in other studies, with the majority of the patients having congenital heart disease.<sup>7,8</sup> In our series, most patients had short fever durations, and no stigmata of IE such as Osler's nodes, Janeway lesions, or Roth's spots.

Using the Duke criteria only 14.2% patients had definite IE, while the others had possible IE. Most authors have suggested modifications to the Duke criteria to improve sensitivity.<sup>9</sup> In our study we observed that splenomegaly and high serum CRP levels were the important values in a patient with fever besides the suspicion. Early surgical intervention is justified, especially for acute IE, when staphylococcal IE is strongly suspected with vegetations.<sup>10</sup>

In our series, without having a surgical procedure the cultures showed 32% Staphylococcus endocarditis (17.8% coagulase negative and 14.3% coagulase positive). This was also shown by Hızlı et al.<sup>3</sup> This result alerts the physician to the need to decide quickly in a patient with high fever and high CRP, because of the fast progression and high mortality/morbidity rate of the causative agent. This finding can also explain the changing features of the infective endocarditis.

Six patients had echocardiographic right-sided vegetations. Right-sided endocarditis is probably more common than is recognized and is therefore underdiagnosed.<sup>11</sup> The right side of the heart is less susceptible to injury from tricuspid regurgitation and pulmonary embolization than from lesions associated with left-sided endocarditis. Fortunately, tricuspid valve lesions can be treated medically. Most of these infections are caused by organisms that can be treated successfully with antibiotics.<sup>12,13</sup>

Our treatment regime consisted of dual intravenous antibiotics. The first line therapy was intravenous penicillin G and amikacin, with further adjustment depending on the result of the blood cultures. The antibiotics were given for at least 4 weeks. During the therapy, the patients were followed using the clinical and echocardiographic findings, blood cultures, and WBC-CRP count. Six patients underwent surgical treatment.

Classically, early surgery was considered to be a greater risk than delayed surgery because of tissue inflammation and the surgery was technically more difficult. In fact, the duration of antibiotic treatment before surgery does not appear to influence the perioperative mortality, or the rate of recurrent infective endocarditis.

Surgery should be rapid in the case of haemodynamic deterioration, where there is no control of infection, or there are large and mobile vegetations. The decision as to the timing of surgery is particularly difficult when there is a neurological complication.<sup>14</sup>

## CONCLUSION

IE occurs primarily in patients with CHD. Rheumatic disease is rarely a predisposing cause. Early diagnosis of IE remains challenging today, because of the changing face of the illness. The Duke criteria for the diagnosis of IE are relevant only for some patients. Clinical suspicion must be the most important criterion for its early diagnosis and treatment.

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