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Original Article

Factors affecting mortality in patients during postoperative follow-up after cardiac surgery in a pediatric intensive care unit

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ABSTRACT

Objective: Congenital heart diseases (CHD) frequently necessitate cardiovascular surgery (CVS) in pediatric patients. This study aimed to evaluate postoperative complications following CVS and to investigate their association with mortality.

Materials and Methods: In this retrospective study, the medical records of 124 patients who underwent CVS and were subsequently monitored in the pediatric intensive care unit were reviewed.

Results: Among the 124 patients who underwent cardiovascular surgery, 52.4% (n=65) were male. The median age was 7 months (range, 2–71). Ventricular septal defect closure (n=49) and complete atrioventricular septal defect repair (n=15) were the most frequently performed procedures. Twenty-seven patients had chromosomal anomalies, most commonly Down syndrome. No postoperative complications were observed in 95 patients. The most common complications were atelectasis, arrhythmia, and subcutaneous emphysema. Extracorporeal therapy was administered to 12 patients. Overall mortality was 8.8% (n=11). Preoperative pulmonary hypertension (PHT) was the most common cause of death. Among the deceased patients, additional factors associated with mortality include infection and lower albumin levels, while nitric oxide therapy and intraoperative cardiopulmonary bypass use were also more common, possibly reflecting greater clinical severity.

Conclusion: As the use of cardiovascular surgery for CHD continues to increase in pediatric patients, optimizing intraoperative management and promptly identifying postoperative complications are crucial for improving survival outcomes.

Keywords: Congenital heart diseases, cardiac surgical procedures, pulmonary hypertension, postoperative complications

Introduction

Congenital heart diseases (CHD) are the most common type of congenital anomaly, which may or may not have a genetic origin. Approximately 40–50% of cases are diagnosed within the first week of life, and 50–60% within the first month (1,2). CHD affects approximately 9 per 1000 live births. Annually, nearly 40000 infants in the United States and 15000 in Türkiye are born with CHD. Almost half of these patients require intervention within the first year of life, and many subsequently require cardiac intensive care support (3,4). It accounts for 3% of neonatal death and 46% of death from all congenital malformations and is the leading cause of neonatal mortality (5-7). CHD is typically classified according to hemodynamic characteristics. It is categorized into four groups based on hemodynamic effects: defects associated with increased pulmonary blood flow (i.e., left-to-right shunts), defects associated with decreased pulmonary blood flow (i.e., right-to-left shunts), obstructive lesions, and defects with mixed circulation (1). Recent data indicate that 61.9% of patients with CHD admitted to the neonatal intensive care unit had cyanotic heart disease, and 87.5% of these cases were classified as complex cardiac defects (8).

Investigations such as echocardiography (ECHO) and electrocardiography (ECG) play a key role in the diagnosis and follow-up of CHD. In complex cases, additional diagnostic modalities, including computed tomography (CT), magnetic resonance imaging (MRI), cardiac catheterization, and angiography, may be required (9).

Patients with CHD may require corrective and/or palliative surgical interventions based on the specific cardiac lesion and hemodynamic condition. Surgical outcomes are

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influenced by multiple factors, including genetic syndromes, low birth weight, and preoperative clinical severity (10).

After cardiovascular surgery, patients with CHD are generally monitored in the intensive care unit under endotracheal intubation for approximately 5–8 hours. They continue to receive care in the pediatric intensive care unit (PICU) or pediatric cardiac intensive care unit (PCICU) until hemodynamic stability is established (11). In recent years, postoperative care for pediatric patients undergoing cardiac surgery has been provided in neonatal intensive care units (NICUs) and pediatric intensive care units (PICUs) worldwide, including in Türkiye. However, despite the high volume of cardiac surgeries, the number of pediatric cardiac intensive care units (PCICUs) remains insufficient (4).

This study investigated the clinical course and postoperative complications of patients undergoing cardiovascular surgery (CVS) and examined their association with mortality in a tertiary pediatric intensive care unit (PICU).

Materials and Methods

The medical data of 124 pediatric patients who underwent cardiovascular surgery and were monitored in the postoperative period in the Pediatric Intensive Care Unit of Diyarbakır Gazi Yaşargil Training and Research Hospital between July 1, 2021, and December 1, 2022 were retrospectively reviewed and recorded. Data were collected from archived files, patient follow-up forms, physician and nursing notes, operative reports, anesthesia records, and discharge summaries stored in the hospital electronic database. The following variables were recorded: demographic characteristics (age and gender), echocardiographic diagnosis, associated syndromes, duration of PICU stay, time to initiation of postoperative feeding, echocardiographic ejection fraction (EF), mortality, and discharge outcomes.

In addition, PRISM scores at PICU admission; vital signs (blood pressure, pulse rate, oxygen saturation, respiratory rate, and level of consciousness); postoperative complications (including pleural effusion, subcutaneous emphysema, atelectasis, pneumothorax, chylothorax, arrhythmias, convulsions, pediatric acute respiratory distress syndrome [PARDS], and hemophagocytic syndrome); type of surgical procedure; extracorporeal therapies administered (peritoneal dialysis [PD], hemodiafiltration [HDF], and extracorporeal membrane oxygenation [ECMO]); laboratory parameters; neutrophil-to-lymphocyte ratio (NLR); and lactate clearance were documented.

For the deceased patients, the following data were additionally recorded: duration of surgery (hours); duration of ICU stay (days); duration of mechanical ventilation (hours); time to initiation of postoperative feeding; postoperative ejection fraction (EF); first-day fluid balance; aortic cross-clamp time (CCT); cardiopulmonary bypass (CPB) time; neutrophil-to-lymphocyte ratio (NLR); postoperative day one albumin level; lactate level at admission; lactate clearance; C-reactive protein-to-albumin (CRP/albumin) ratio; and lactate-to-albumin ratio. Surgical risk stratification was performed using the RACHS-1 (Risk Adjustment for Congenital Heart Surgery) classification system. Each patient was assigned a RACHS-1 category based on the primary surgical procedure. RACHS-1 has been previously validated as a reliable method for risk adjustment in congenital cardiac surgery and shown to be associated with postoperative mortality (12). Due to the limited number of mortality events in our cohort, RACHS-1 categories were dichotomized into low surgical risk (categories 1–2) and high surgical risk (≥3) groups for statistical analysis to avoid sparse data bias and improve model stability.

Pulmonary hypertension was defined based on echocardiographic findings documented by a pediatric cardiologist. Peritoneal dialysis was initiated in patients with fluid overload unresponsive to medical treatment or acute kidney injury. ECMO was initiated in patients with refractory cardiogenic shock or PARDS despite maximal medical therapy. Pediatric acute respiratory distress syndrome (PARDS) was defined according to the Pediatric Acute Lung Injury Consensus Conference (PALICC) criteria (13).

All echocardiographic evaluations were performed by experienced pediatric cardiologists using standardized institutional protocols. Inhaled nitric oxide (iNO) therapy was initiated at an initial dose of 10-20 ppm and adjusted based on arterial oxygenation, pulmonary artery pressure, and overall hemodynamic status. The dose was individualized according to clinical response and gradually weaned once oxygenation improved. The type and dosage of inotropic agents were recorded. For statistical analysis, the maximum VIS value within the first 24 hours after PICU admission was used. The daily vasoactive-inotropic score (VIS) was calculated using the following formula: VIS=dopamine dose (mcg/kg/min)+dobutamine dose (mcg/kg/min)+100×epinephrine dose (mcg/kg/min)+10 × milrinone dose (mcg/kg/min)+10.000 × vasopressin dose (U/kg/min) + 100×norepinephrine dose (mcg/kg/min) (14).

Statistical analysis

Statistical analyzes were performed using SPSS for Windows, Version 26.0 (Chicago, IL, USA). Descriptive statistics were presented as mean and standard deviation or median (minimum–maximum) for continuous variables and as percentages for categorical variables. Normality of distribution was assessed using the Kolmogorov–Smirnov test. Depending on data distribution, comparisons between groups were performed using the Student's t-test or the Mann–Whitney U test. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate. A two-tailed p-value < 0.050 was considered statistically significant. Univariate logistic regression analysis was performed to evaluate the association between high-risk RACHS category (≥3) and mortality. The strength of association was expressed as odds ratios (ORs) with 95% confidence intervals (CIs). Receiver operating characteristic (ROC) curve analysis was conducted to assess the discriminative performance of RACHS category for predicting mortality, and the area under the curve (AUC) was calculated. Due to the limited number of mortality events (n=11), multivariate logistic regression analysis was not performed to avoid model overfitting.

Results

Of the 124 pediatric patients who underwent cardiovascular surgery (CVS) and were admitted to the pediatric intensive

care unit over a one-year period, 65 (52.4%) were male and 59 (47.6%) were female. The median age was 7 months (range: 2–71 months). The demographic characteristics of the patients are presented in Table I.

Table I: Demographic data of patients

Variables	Values
Gender*	
Male	65 (52.4)
Female	59 (47.6)
Age, months†	7 (2-71)
Body weight, kg†	5.8 (2.50-53)
Patients with genetic syndromes*	27 (21.8)
Exitus*	11 (8.8)

***:** n(%), **†:** median(min-max)*

Table II: Cardiac diagnoses and corresponding surgical interventions in the study population

Diagnosis/ operation	Primary	Secondary
Ventricular septal defect	51 (41.1)	16 (12.9)
Common atrioventricular canal defect	18 (14.5)	-
Tetralogy of Fallot	13 (10.5)	-
Coarctation of Aortic	7 (5.6)	6 (4.8)
Transposition of great arteries	7 (5.6)	-
Single ventricle	6 (4.8)	-
Total anomalous pulmonary venous drainage	5 (4.0)	-
Hypoplastic left heart syndrome	4 (3.2)	-
Tricuspid atresia	3 (2.4)	-
Double outlet right ventricle	3 (2.4)	-
Patent Ductus Arteriosus	2 (1.6)	32 (25.8)
Atrial septal defect	1 (0.8)	10 (8.1)
Aortopulmonary window	1 (0.8)	-
Hypoplastic right ventricle	1 (0.8)	-
Truncus arteriosus	1 (0.8)	-
Mitral atresia	1 (0.8)	-
Cardiac tumour	-	1 (0.81)
VSD closure	49 (39.5)	3
CAVCD repair	15 (12.1)	1
Pulmonary banding	11 (8.9)	-
Complete repair of tetralogy of Fallot	11 (8.9)	-
Bidirectional cavopulmonary anastomosis	10 (8.1)	-
Aortic Coarctation Repair	8 (6.5)	-
TAPVD repair	5 (4.0)	-
PDA ligation	4 (3.2)	42
Norwood stage 2	3 (2.4)	-
Aortopulmonary Window Closure	2 (1.6)	-
PDA closure	1 (0.8)	7
ASD repair	1 (0.8)	19
Hypoplastic Aortic Arcus Reconstruction	1 (0.8)	-
Blalock-Taussig Shunt	1 (0.8)	1
Kawashima procedure	1 (0.8)	-
Intracardiac tumour repair	1 (0.8)	-
Atrial septectomy	-	3
Pulmonary banding	-	4
Valvuloplasty/annuloplasty, tricuspid valve repair	-	8

***:** n(%), **ASD:** Atrial septal defect, **CAVCD:** Common atrioventricular canal defect, **PDA:** Patent ductus arteriosus, **TAPVD:** Total anomalous pulmonary venous drainage, **VSD:** Ventricular septal defect*

Table III: Complications

Complications	Values
No complication	95 (76.6)
Atelectasis	10(8)
Subcutaneous emphysema	9 (7.2)
Arrhythmia	9 (7.2)
JET	4 (3.2)
SVT	2(1.6)
VT	2(1.6)
AT	1(0.8)
Hypertension	4(3.2)
Chylothorax	3(2.4)
Pleural effusion	3(2.4)
Pneumothorax	3(2.4)
Pulmonary oedema	2(1.6)
Convulsion	2(1.6)
PARDS	2(1.6)
Diaphragmatic paralysis	1(0.8)
Cardiac tamponade	1(0.8)
Haemophagocytic syndrome	1(0.8)

***PARDS:** Pediatric acute respiratory distress syndrome, **AT:** Atrial tachycardia, **JET:** Junctional ectopic tachycardia, **SVT:** Supraventricular tachycardia, **VT:** Ventricular tachycardia*

The most common diagnoses were ventricular septal defect (VSD), common atrioventricular canal defect (CAVCD), tetralogy of Fallot (TOF), coarctation of the aorta (CoA), transposition of the great arteries (TGA), and other disorders, in descending order of frequency. The most frequently performed procedures were VSD closure (n=49) and CAVCD repair (n=15). In addition, 42 patients underwent concomitant patent ductus arteriosus (PDA) ligation. The primary and secondary procedures are presented in Table II. Twenty-seven patients had genetic syndromes, including 26 with Down syndrome and one with Trisomy 18 (Table I). The patient with trisomy 18 underwent VSD closure and PDA ligation. Among patients with Down syndrome, VSD closure was the most frequently performed procedure (n=12).

Ninety-five patients (76.6%) developed no postoperative complications. Twenty-nine patients experienced complications, most commonly atelectasis, followed by arrhythmia and subcutaneous emphysema. The least frequent complication was diaphragmatic paralysis (0.8%). Multiple complications occurred in 17 patients (13.7%) (Table III).

Extracorporeal therapy was administered to 12 patients: peritoneal dialysis (n=7), hemodiafiltration (n=2), extracorporeal membrane oxygenation (ECMO) (n=2), and plasmapheresis (n=1).

A total of 113 patients were discharged from the PICU to the cardiovascular surgery ward, whereas 11 patients (8.8%) died. Among the deceased patients, three had undergone bidirectional cavopulmonary anastomosis, two pulmonary banding, two VSD closure, two CAVCD repair, and two complete repair of TOF. One patient with Down syndrome who underwent CAVCD repair died. Three of the seven patients who received peritoneal dialysis died, whereas the remaining nine patients who received extracorporeal therapy were discharged from the PICU.

Table IV: Evaluation of data of patients with and without exitus

Variables	Discharged	Exitus	p
Total number of patients	113	11	-
Duration of surgery (hours)*	3.5 (1-6)	4.25 (3-6)	0.306
PICU hospitalisation duration (days)*	5.5 (2-113)	17 (3-6)	0.103
Duration of mechanical ventilator stay (hours)	4.5 (1-36)	9.5 (1-23)	0.710
Post-op feeding initiation time (hours)*	11 (4-51)	10 (4-51)	0.549
VIS score*	12 (5-27)	19.5 (5-31)	0.076
Post-op ejection fraction*	65 (50-75)	65 (50-75)	0.407
Total fluid given on the first day (ml/kg/day)*	100 (60–160)	95 (70–120)	0.241
Cross clamp time (minutes)*	73 (10–186)	95 (18–198)	0.225
Cardiopulmonary bypass time (minutes)*	117 (38-227)	141.5 (60-190)	0.649
Neutrophil/lymphocyte ratio*	3.44 (0.88-17.13)	2.68 (1.12–7.81)	0.452
Albumin post-op 1st day*	33 (16–48)	26 (2.9–47)	0.049
Initial lactate level at admission*	2.8 (0.8-12.69)	3 (1.4–10.09)	0.161
Lactate clearance*	30 (-180–100)	-17.41 (-85.71–32.30)	0.157
C reactive protein/albumin*	0.19 (0.01–7.56)	1.1 (0.34–8.52)	0.001
Lactate/albumin ratio*	0.08 (0.02–0.43)	0.10 (0.03–2.01)	0.075
Patients with genetic syndromes†	25 (22.1)	2 (18.2)	0.763
Complications†	35 (31)	6 (54.5)	0.114
Chylothorax†	7 (6.2)	1 (9.1)	0.133
Additional surgery†	37 (32.7)	2 (18.2)	0.348
Heart failure†	46 (40.7)	4 (36.4)	0.142
Pulmonary hypertension†	28 (24.8)	6 (54.5)	0.035
Nitric oxide†	20 (17.7)	4 (36.4)	0.002
Development of infection†	42 (37.2)	3 (27.3)	0.023
Sepsis†	10 (8.8)	6 (54.5)	0.002
Ventilator-associated pneumonia†	2 (1.8)	1 (9.1)	0.131
Cardiopulmonary bypass†	39 (34.5)	3 (27.3)	0.013

:** *Median (min–max) (Mann–Whitney U test),* **†:** *n (%) (Fisher's exact test),* ***PICU: *Pediatric intensive care unit,* ***VIS:*** *Vasoactive inotrope score*

Table V: ROC analysis of mortality predictors

Variable	AUC	95% CI	Cutoff	Sensitivity (%)	Specificity (%)
Albumin	0.748	0.155–0.349	≤42.5 g/L	100	48.7
CRP/Albumin	0.843	0.770–0.916	≥0.465	90.9	75.2
RACHS (1–4)	0.626	0.462–0.790	≥3	63.6	63.7

Comparison of survivors and non-survivors revealed significant associations between mortality and the presence of preoperative pulmonary hypertension (PHT), lower postoperative albumin levels, higher C-reactive protein-to-albumin (CRP/albumin) ratios, nitric oxide administration, infection, and use of cardiopulmonary bypass (Tables IV).

Univariate logistic regression analysis was performed to evaluate the association between high-risk RACHS category (≥3) and mortality. Although patients in the high-risk RACHS group had a higher odds of mortality (OR: 3.07, 95% CI: 0.85–11.13), this association did not reach statistical significance (p=0.087).

Receiver operating characteristic (ROC) curve analysis demonstrated limited discriminative ability of RACHS category for predicting mortality, with an area under the curve (AUC) of 0.626, indicating poor-to-fair performance. There were 11 deaths (8.9%) among 124 patients. ROC analysis demonstrated that the CRP/albumin ratio predicted mortality with an AUC of 0.843, indicating good discriminative ability. The optimal cutoff value was ≥0.465, yielding a sensitivity of 90.9% and a specificity of 75.2%. ROC analysis demonstrated that postoperative albumin predicted mortality with an AUC of 0.748. The optimal cutoff value was ≤42.5 g/L, yielding a sensitivity of 100% and a specificity of 48.7% (Table V).

With respect to surgical type, mortality was highest among patients who underwent CAVCD repair (3/11). These patients developed complications including arrhythmia, PHT, pneumothorax, and pleural effusion. Two of them required intraoperative cardiopulmonary bypass. No significant difference in age was observed between deceased and surviving patients.

Two patients died within the first 48 hours postoperatively. One had undergone complete TOF repair with prolonged aortic cross-clamp time (198 minutes) and signs of sepsis. The other patient, who underwent VSD closure, had preoperative PHT and developed postoperative atelectasis.

The median maximum VIS within the first 24 hours after PICU admission was higher in non-survivors compared to survivors (22 vs. 12). However, this difference did not reach statistical significance (p=0.076).

Discussion

In our study, preoperative pulmonary hypertension was the most frequently observed clinical characteristic among non-survivors. Analysis of the 11 deceased patients further showed that infection and lower albumin levels were more common in this group. Nitric oxide therapy and intraoperative cardiopulmonary bypass use were also more frequently observed among non-survivors; however, these interventions were initiated in response to clinical deterioration and may therefore reflect postoperative instability rather than independent predictors of mortality. ROC analysis demonstrated that lower postoperative albumin levels had moderate discriminative ability for predicting mortality. In contrast, the CRP/albumin ratio showed good predictive performance. Nevertheless, due to the limited number of mortality events, these findings should be interpreted with caution and require validation in larger, prospective cohorts. Previous studies have demonstrated that survival rates after pediatric cardiac surgery have increased in recent years, whereas the rate of early mortality is reported to be approximately 3–4% (14-18).

Although nitric oxide administration and ECMO support were statistically associated with mortality, these findings should be interpreted as indicators of disease severity rather than independent causal factors. The requirement for advanced cardiopulmonary support generally reflects a more critical clinical status, which itself contributes to increased mortality risk.

In a cohort of 174 patients, Gaies et al. (14). reported a mortality rate of 12% following pediatric cardiovascular surgery. Comparatively, the mortality rate in our study was 8.8%. Early mortality (within the first 48 hours) occurred in two patients, representing 1.6% of the entire cohort and 18.2% of total deaths (14).

Twenty-nine patients (23.4%) developed postoperative complications. Arrhythmia and atelectasis were the most common complications. In a study conducted in adult patients, Khajali et al. (19) reported a respiratory complication rate of 14.9%. In a cohort of 326 adult patients, pleural effusion occurred in 5% of cases, while 3.75% developed other pulmonary complications (20). Studies involving pediatric patients undergoing CVS have generally not provided detailed information regarding postoperative complications. However, arrhythmias are consistently reported as the most common complication in the postoperative period.

In our cohort, arrhythmia was among the most frequent complications and occurred in 9 patients (7.2%). These included four cases of junctional ectopic tachycardia (JET), two supraventricular tachycardia (SVT), two cases of ventricular tachycardia, and one atrial tachycardia. One patient with JET died postoperatively. Consistent with our findings, Khan et al. (21) reported an arrhythmia rate of 10%, while Ergün et al. (22) reported a rate of 9.2%.

In a study including patients older than 15 years who underwent total correction of tetralogy of Fallot (TCTF), Khajali et al. (19) reported multiorgan failure in 5 of 94 patients, all of whom died. Among these five patients, two developed sepsis, two experienced acute kidney injury, and three required extracorporeal membrane oxygenation (ECMO).

In our study, one patient who died after complete repair of tetralogy of Fallot underwent cardiopulmonary bypass and had a prolonged aortic cross-clamp time (198 minutes), along with clinical signs of sepsis.

Similarly, Öztürk et al. (10) reported ECMO use in 26 patients (2.9%) with transposition of the great arteries (TGA) as the primary diagnosis. ECMO was initiated mainly due to hypoxemia secondary to PARDS, while other indications were cardiac causes. Two patients in our study required extracorporeal membrane oxygenation (ECMO) due to PARDS. Their primary diagnoses were left ventricular hypoplasia and tetralogy of Fallot (TOF). Both patients survived and were discharged.

None of the patients who underwent surgery for transposition of the great arteries (TGA) required ECMO support. Nine patients required extracorporeal therapies other than ECMO, including peritoneal dialysis (PD) and hemodiafiltration (HDF), due to fluid overload and/or renal failure. One patient underwent plasmapheresis for hemophagocytic lymphohistiocytosis.

Öztürk et al. (10) reported that 12% (107/895) of patients undergoing CVS had associated genetic syndromes, including Down syndrome and DiGeorge syndrome. In our study, 27 patients (21.7%) had genetic syndromes, consisting of Down syndrome and trisomy 18. The higher prevalence observed in our cohort may be related to advanced maternal age in the region where the study was conducted.

Although the high-risk RACHS category (≥3) was associated with an approximately three-fold increase in mortality, this association did not reach statistical significance. The limited number of mortality events in our cohort may have reduced the statistical power to detect a significant difference. Furthermore, ROC curve analysis demonstrated limited discriminative ability of RACHS for predicting mortality (AUC=0.626), indicating poor-to-fair performance. This modest predictive value may be explained by the small number of deaths and the heterogeneity of surgical procedures included in the study population.

In our study, non-survivors demonstrated higher VIS values within the first 24 hours, this difference did not reach statistical significance. The maximum VIS in the first 24 hours is one of the most commonly used and validated parameters in the pediatric cardiac surgery literature, as it effectively reflects early postoperative hemodynamic support requirements and has been shown to correlate with important clinical outcomes including morbidity and mortality.While serial or trend-based VIS assessments at multiple postoperative time points may provide additional insight into the dynamic clinical course, as emphasized by Davidson et al. (23), we selected the maximum value in the first 24 hours because this approach is practical, widely accepted in retrospective studies, and strongly supported by previous validation studies (24,25).

Limitations

This study has several limitations. First, it was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. Second, the number

of mortality events was low (n=11), which restricted the statistical power of the analyses and precluded multivariate logistic regression modeling. Third, due to the observational design of the study, causal relationships between identified risk factors and mortality cannot be established. In addition, the heterogeneity of surgical procedures included in the cohort may have influenced the overall predictive performance of the RACHS classification. Larger, multicenter studies with a greater number of events are needed to validate these findings.

Conclusion

In conclusion, CVS procedures for congenital heart disease (CHD) have steadily increased in the pediatric population. Awareness of intraoperative factors and early recognition of postoperative complications may improve survival outcomes in these patients.

Presented

This study was accepted for oral presentation and presented at the 69th Turkish National Pediatrics Congress, held on October 15–19, 2025, at Elexus Hotel, Turkish Republic of Northern Cyprus (TRNC).

Ethics committee approval

This study was conducted in accordance with the Helsinki Declaration Principles. The study was approved by Diyarbakır Gazi Yaşargil Training and Research Hospital (09.07.2021, reference number: 830).

Contribution of the authors

Study conception and design: MNT, EET; Data collection: ÖO, FK, MNT; Analysis and interpretation of results: AA, FK; Draft manuscript preparation: MNÖ, BA, A A; All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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