

Intracardiac Thrombi in Paediatric Patients: A Case Series of Ten Heterogeneous Etiologies with Clinical Outcomes

Pediatric Hastalarda Intrakardiyak Trombüs: Farklı Etyolojilere Sahip On Hastanın Klinik Sonuçları

Ayşe Büşra Paydaş (0000-0001-8002-1087), Uğur Saraç (0009-0000-0652-5834), Mehmet Burhan Oflaz (0000-0003-1515-4654), Fatih Şap (0000-0001-7870-9704), Tamer Baysal (0000-0001-6145-1831)

Necmettin Erbakan University Faculty of Medicine, Department of Pediatric Cardiology, Konya, Türkiye

Cite this article as: Paydaş AB, Saraç U, Oflaz MB, Şap F, Baysal T. Intracardiac thrombi in paediatric patients: a case series of ten heterogeneous etiologies with clinical outcomes. J Curr Pediatr. [Epub Ahead of Print]



Abstract

Introduction: An intracardiac thrombus is a rare yet potentially life-threatening condition in the paediatric population. This study aimed to describe the clinical characteristics, diagnostic findings, treatment strategies, and outcomes of paediatric patients diagnosed with intracardiac thrombus.

Materials and Methods: A retrospective study was conducted including patients aged 0–17 years who were diagnosed with intracardiac thrombus between February 2020 and May 2025 at our paediatric cardiology clinic. Demographic characteristics, clinical presentation, echocardiographic findings, treatment modalities, and clinical outcomes were reviewed. The study was retrospective and observational in design.

Results: Ten patients were identified with a median age of 3 years (range: 10 days to 17 years), of whom seven were female (70%). The most common thrombus location was the right atrium (70%). Six patients (60%) had a history of central venous catheterization. Anticoagulation therapy was initiated in all patients, while three patients (30%) required surgical thrombectomy due to an inadequate response to medical treatment. Complications included a cerebrovascular event in one patient, pulmonary embolism in two patients, and one death.

Conclusion: Intracardiac thrombus in children is associated with multiple risk factors. Although anticoagulation therapy remains the primary treatment option, surgical intervention may be required in selected cases. The absence of a standardized treatment duration highlights the importance of individualized management and the need for further multicentre studies.

Öz

Giriş: İntrakardiyak trombüs pediatrik popülasyonda nadir görülen ancak potansiyel olarak yaşamı tehdit edebilen bir durumdur. Bu çalışmada intrakardiyak trombüs tanısı alan pediatrik hastaların klinik özelliklerinin, tanısal bulgularının, tedavi stratejilerinin ve sonuçlarının tanımlanması amaçlandı.

Gereç ve Yöntem: Şubat 2020 ile Mayıs 2025 tarihleri arasında pediatrik kardiyoloji kliniğimizde intrakardiyak trombüs tanısı alan 0–17 yaş arası hastalar retrospektif olarak değerlendirildi. Demografik veriler, klinik başvuru özellikleri, ekokardiyografik bulgular, tedavi yöntemleri ve klinik sonuçlar incelendi. Çalışma retrospektif ve gözlemsel niteliktedir.

Bulgular: Medyan yaşı 3 yıl (10 gün–17 yıl) olan toplam 10 hasta saptandı; hastaların yedisi kızdı (%70). En sık trombüs yerleşimi sağ atriymdu (%70). Altı hastada (%60) santral venöz kateter öyküsü mevcuttu. Tüm hastalara antikoagülan

Keywords

Anticoagulant, child, echocardiography, thrombectomy, thrombosis

Anahtar kelimeler

Antikoagülan, çocuk, ekokardiyografi, trombektomi, tromboz

Received/Geliş Tarihi : 27.01.2026

Accepted/Kabul Tarihi : 15.10.2026

Epub : 22.10.2026

DOI:10.4274/jcp.2026.95605

Address for Correspondence/Yazışma Adresi:

Ayşe Büşra Paydaş, Necmettin Erbakan University Faculty of Medicine, Department of Pediatric Cardiology, Konya, Türkiye
E-mail: draysebusra@gmail.com



tedavi başlandı; ancak üç hastada (%30) yetersiz tedavi yanıtı nedeniyle cerrahi trombektomi uygulandı. Komplikasyonlar arasında bir hastada serebrovasküler olay, iki hastada pulmoner emboli ve bir ölüm yer aldı.

Sonuç: Çocuklarda intrakardiyak trombüs çok sayıda risk faktörü ile ilişkilidir. Antikoagülan tedavi temel yaklaşım olmakla birlikte, seçilmiş olgularda cerrahi girişim gerekebilir. Standart bir tedavi süresinin bulunmaması, bireyselleştirilmiş hasta yönetiminin ve çok merkezli ileri çalışmaların gerekliliğini göstermektedir.

Introduction

An intracardiac thrombus is a rare yet potentially life-threatening condition in the paediatric population. Because large-scale studies are lacking, knowledge of this condition relies heavily on case series and isolated reports, leaving its true incidence in children poorly defined (1,2). Multiple predisposing factors have been characterised, including prematurity, cyanotic heart disease, sepsis, malignancy, central or umbilical venous catheterization, surgery, and both acquired and inherited thrombophilias (3,4). Echocardiography is the diagnostic modality of choice due to its non-invasive nature, widespread accessibility, and high sensitivity (5). In contrast to the adult population, where intracardiac thrombi frequently localise to left-sided cardiac chambers, paediatric presentations demonstrate a predilection for right heart involvement (6).

Therapeutic approaches in children remain largely derived from adult protocols and are influenced by multiple variables such as patient age, clinical syndrome, thrombus dimensions, anatomical location, and degree of mobility (2). Anticoagulation is still considered the first-line therapy, although surgical thrombectomy or pharmacological thrombolysis may be warranted in selected cases. The optimal duration of anticoagulation in children, however, remains a matter of debate (1).

Given the relative rarity of paediatric intracardiac thrombus and its documentation primarily through small case series, there is a need for thorough characterisation of its varied clinical presentations. Our study, therefore, aims to contribute to the existing literature by detailing the heterogeneous aetiologies, management strategies, and clinical outcomes in a diverse series of ten paediatric cases.

Materials and Methods

We conducted a retrospective review of all patients aged 0–17 years diagnosed with intracardiac thrombus between February 2020 and May 2025 at the Paediatric Cardiology Department of Necmettin Erbakan University Faculty of Medicine.

Patients were excluded if they were older than 17 years, had received anticoagulant therapy prior to diagnosis, or

had an intracardiac mass subsequently confirmed as non-thrombotic. Transthoracic echocardiography was used for both diagnosis and follow-up assessment.

We collected demographic data, clinical presentations, echocardiographic characteristics, treatment modalities, and outcomes for analysis. A thrombophilia panel was performed in eight patients.

Statistical Analysis

Statistical analysis was conducted on SPSS version 18.0 (SPSS Inc., Chicago, Illinois, United States of America).

Results

Between February 2020 and May 2025, ten paediatric patients were diagnosed with intracardiac thrombus at our institution. The median age was 3 years (range: 10 days to 17 years), and seven patients (70%) were female.

Six patients had a history of central venous catheterisation, whilst an atrial septal defect was identified in three patients (30%). One patient was in the third month following atrial septal defect repair and was not receiving aspirin therapy at the time of thrombus detection. Among the patients with prior catheterisation, two had undergone plasmapheresis and one had a surgical history related to extremity fracture repair. All relevant demographic, clinical, and echocardiographic data are summarised in Table 1.

Echocardiography showed that thrombi were located predominantly in the right atrium ($n=7$, 70%). In the remaining patients, thrombi were found in the right ventricle ($n=1$), the left ventricle ($n=1$), and at the junction of the inferior vena cava and the right atrium ($n=1$). Ventricular function was preserved across the cohort, with a mean left ventricular ejection fraction of 65% (range: 52–73%) and a mean fractional shortening of 36% (range: 24–41%). Detailed echocardiographic findings are presented in Table 1. Representative images are shown in Figure 1, and the pre- and post-treatment views for Case 9 are shown in Figure 2.

Treatment and Outcomes

Seven patients were treated with a combination of aspirin and low molecular weight heparin, while three received

Table 1. Demographic, clinical, and echocardiographic features of patients with intracardiac thrombus

Case	Sex	Age (at diagnosis)	Cardiac disease	Comorbidities	CVC history	Thrombus location	Thrombus size (mm)	Morphology
1	Female	12 months	None	AML	Yes	Right ventricle	7×8	Pedunculated
2	Female	8.5 years	None	DCM, CVE, PCD	No	Left ventricle	14×4	Mural
3	Female	2 months	ASD	IBD, Sepsis	Yes	Right atrium	9×7	Mural
4	Female	14 years	ASD, MVP, MR, FXD	Post-op ASD	No	Right atrium	14×16	Pedunculated
5	Male	5 years	None	ALL, IE, PCD	Yes	Right atrium	6×8	Vegetative
6	Female	10 days	None	HIE, MTHFR	Yes	Right atrium	6×5	Mural
7	Female	13 years	None	MS, JIA	Yes	Right atrium	17×12	Mural
8	Male	10 days	ASD	Prematurity, Sepsis	Yes	IVC-RA junction	7×3	Occlusive
9	Female	10 years	MR, PFO	MIS-C, PE, MTHFR	No	Right atrium	9×6	Mural
10	Male	17 years	None	Obesity, Fracture surgery, PE	No	Right atrium	3×9	Serpiginous, mobile

ALL: Acute lymphoblastic leukaemia, AML: Acute myeloid leukaemia, ASD: Atrial septal defect, CVC: Central venous catheter, CVE: Cerebrovascular event, DCM: Dilated cardiomyopathy, FXD: Factor X deficiency, HIE: Hypoxic-ischemic encephalopathy, IBD: Inflammatory bowel disease, IE: Infective endocarditis, IVC-RA: Inferior vena cava-right atrium, JIA: Juvenile idiopathic arthritis, MIS-C: Multisystem inflammatory syndrome in children, MR: Mitral regurgitation, MS: Multiple sclerosis, MTHFR: Methylenetetrahydrofolate reductase mutation, MVP: Mitral valve prolapse, PCD: Protein C deficiency, PE: Pulmonary embolism, PFO: Patent foramen ovale

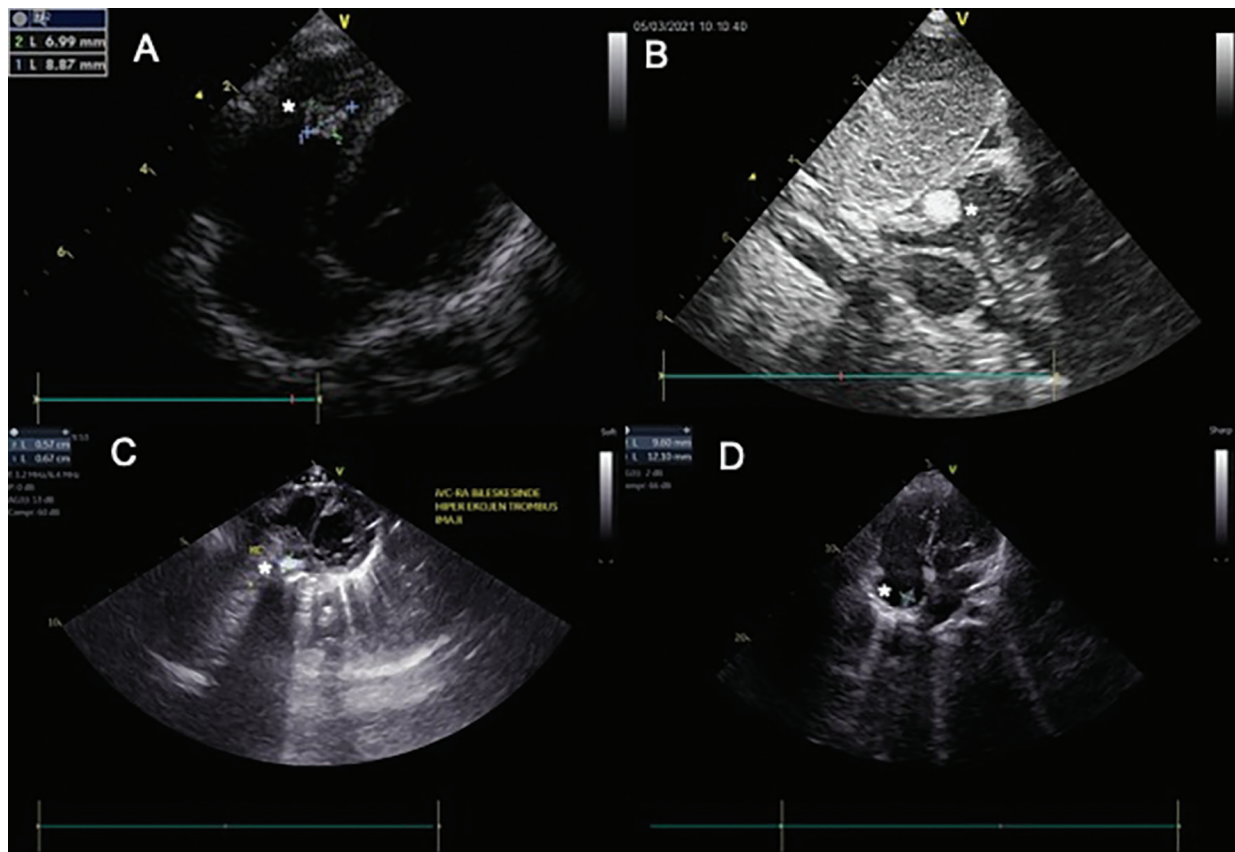


Figure 1. Transthoracic echocardiographic images demonstrating intracardiac thrombi (indicated by asterisks). (A) Case 1, right ventricular thrombus in the apical four-chamber view. (B) Case 3, right atrial thrombus in the subcostal bicaval view. (C) Case 8, thrombus at the junction of the inferior vena cava and right atrium in the subcostal view. (D) Case 4, right atrial thrombus in the apical four-chamber view

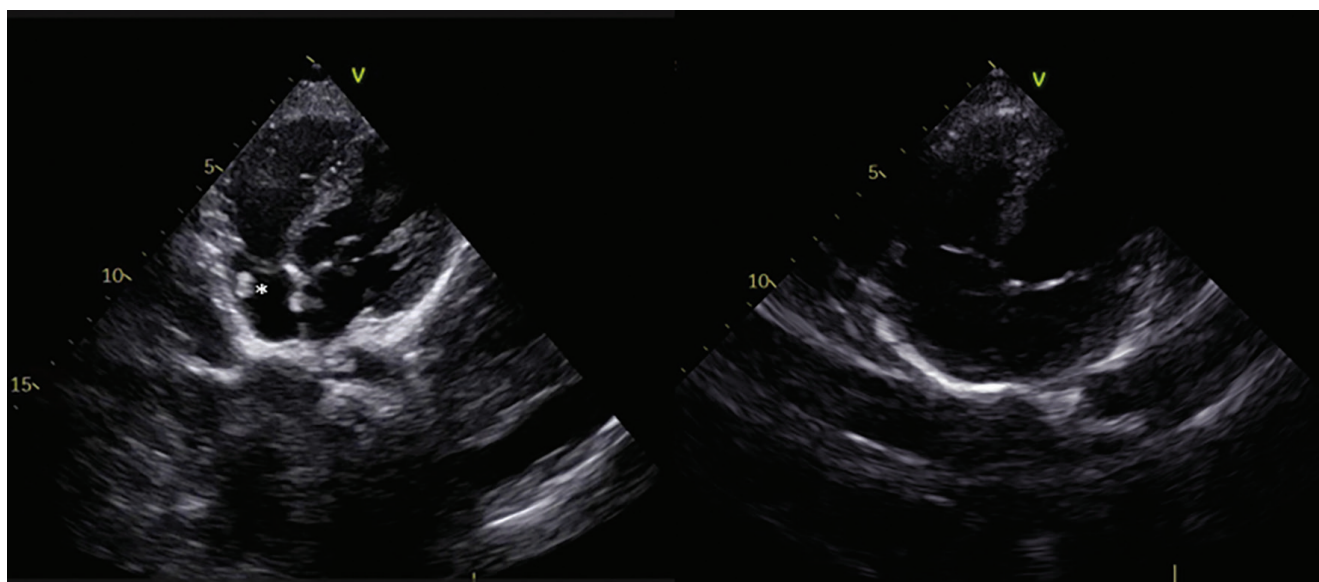


Figure 2. Apical four-chamber echocardiographic images of Case 9. The left panel shows a right atrial thrombus (indicated by an asterisk) before treatment. The right panel shows follow-up imaging after treatment, demonstrating thrombus resolution

low molecular weight heparin monotherapy. One patient (Case 10) was treated with systemic tissue plasminogen activator for a massive pulmonary embolism. The median overall treatment duration was 90 days (range: 18 days to 12 months), with low molecular weight heparin administered for a median of 40 days and aspirin for a median of 180 days. In Case 9, aspirin therapy was initiated but discontinued on day three due to tinnitus, with subsequent management consisting of low molecular weight heparin for 14 days followed by dipyridamole for three months.

Three patients (30%) with right atrial thrombi who did not respond to medical therapy required surgical thrombectomy. Significant complications occurred, including a cerebrovascular event in one patient, pulmonary embolism in two, and one death. Treatment regimens and clinical outcomes are detailed in Table 2.

We performed thrombophilia screening in eight patients. Genetic analysis identified a heterozygous methylenetetrahydrofolate reductase c.1298A>C polymorphism in two patients. Coagulation protein deficiencies were also detected: two cases of isolated protein C deficiency, one case of combined protein C and S deficiencies, and one case of factor X deficiency.

Discussion

This case series describes the diagnosis, management, and outcomes of ten paediatric patients with intracardiac thrombus. The primary contribution of our study lies in

its documentation of the significant clinical heterogeneity observed in this population, reinforcing the need for individualized care. While most literature is limited to fewer cases, provides broader insight into the diverse risk factors that clinicians may encounter, ranging from central venous catheter use to underlying thrombophilias.

Previous studies have reported varying demographic patterns. John et al. (1) described a mean age of 8.8 years among 31 paediatric patients, with a male predominance (22 males, 9 females). Ozkutlu et al. (7) reported ages ranging from 7 days to 5 years, again with male predominance (8 males, 3 females). Our series demonstrated a lower median age of 3 years and female predominance, highlighting the demographic variability in this condition.

Common aetiological risk factors include prematurity, cyanosis, bacteraemia, malignancies, nephrotic syndrome, indwelling catheters, cardiac surgeries, and acquired or hereditary thrombophilias (3,4). Agarwal et al. (6) identified central venous catheter use (73%), congenital heart disease (41%), malignancies (25%), and active infections (24%) as leading risk factors in 51 paediatric patients. In contrast to adults, where intracardiac thrombus typically associates with myocardial infarction, dilated cardiomyopathy, and atrial arrhythmias (2), our series identified similar paediatric risk factors including leukaemia, dilated cardiomyopathy, prematurity, hypoxaemia, sepsis, central venous catheter use, and recent surgery.

Table 2. Treatments and clinical outcomes of patients with intracardiac thrombus

Case	LMWH duration	Aspirin duration	Surgical thrombectomy	Outcome
1	18 days	—	No	Deceased
2	8 months	11 months	No	Partial thrombus resolution
3	10 days	6 months	Yes	Thrombectomy
4	6 months	1 year	Yes	Thrombectomy
5	1 month	1 month	Yes	Thrombectomy
6	7 months	7 months	No	Partial thrombus resolution
7	40 days	3 months	No	Complete thrombus resolution
8	3 months	—	No	Complete thrombus resolution
9	2 weeks	3 days	No	Complete thrombus resolution
10	2 weeks + tPA	—	No	Complete thrombus resolution

LMWH: Low molecular weight heparin, tPA: Tissue plasminogen activator

Echocardiography remains the diagnostic modality of choice, offering non-invasive, accessible, and rapid assessment with reported sensitivity and specificity of 95% and 86%, respectively (5). Two-dimensional transthoracic echocardiography provided detailed information regarding thrombus location, size, relationship to adjacent structures, and impact on cardiac function. It proved equally valuable for monitoring thrombus resolution and guiding treatment duration. Consistent with Agarwal et al. (6), who reported right atrial involvement in 59% of cases, the right atrium was the predominant site in our series.

The incidence of catheter-related venous thrombosis in children ranges between 25% and 40%, whereas right atrial thrombus prevalence in patients with central venous catheters ranges from 5.4% to 12.5% (2). The free tip of the central venous catheter can cause endothelial injury, promoting thrombus formation. The risk is higher when the catheter tip lies within the right atrium compared to the superior vena cava (8). The catheter tip can cause endothelial injury, promoting thrombus formation, with higher risk when positioned within the right atrium compared to the upper caval vein (8). In our cohort, 60% had prior central venous catheter placement, with all associated thrombi located in the right heart. Clinicians should maintain high suspicion for right atrial thrombus in patients with prolonged hospitalisation and central venous catheters, particularly when new symptoms develop, and should promptly perform an echocardiographic evaluation.

Intracardiac thrombus prevalence in dilated cardiomyopathy ranges from 6% to 53%, most commonly affecting the left ventricle (2). Case 2 in our series presented with acute cerebral infarction, with echocardiography revealing dilated

cardiomyopathy and a 14.2×4.4-millimetre mural thrombus at the left ventricular apex. Thrombophilia screening revealed protein C deficiency, and the thrombus resolved with medical treatment. Surgical thrombectomy is generally recommended for left-sided, pedunculated thrombi exceeding 2 centimetres due to increased embolization risk (3). Our patient's smaller, mural thrombus was appropriately managed medically.

The 2024 American Society of Haematology/International Society on Thrombosis and Haemostasis guidelines recommend anticoagulation for paediatric patients with right atrial thrombus who have high-risk features and low bleeding risk (9). Determining optimal anticoagulation duration remains challenging. The 2012 American College of Chest Physicians guidelines recommend at least three months of anticoagulation for right atrial thrombi but provide no guidance for longer durations (1). Our patients received treatment for a median of 90 days.

Protein C and its cofactor protein S are important natural anticoagulants, with deficiencies being either congenital or acquired (7,10). Ozkutlu et al. (7) reported protein C deficiency as a causative factor in 3 of 11 paediatric patients (7). Our series identified protein C deficiency in two cases and concurrent protein C and S deficiency in one case. Although these patients had other prothrombotic conditions, we consider these deficiencies as contributing factors.

Given the heterogeneity of intracardiac thrombi in paediatric patients, future research should focus on developing standardised, evidence-based clinical decision tools. A morphology-based risk scoring system could aid in stratifying embolic risk and guiding therapeutic intensity. An age- and site-specific anticoagulation algorithm may optimise treatment duration and outcomes.

Study Limitations

This study has several limitations inherent to its design. As a retrospective, single-centre report, it is limited by a small sample size, which precludes robust statistical analysis. However, this focus on a small cohort allows for a detailed descriptive analysis of a clinically heterogeneous group, which is the study's principal strength. Besides, the diversity of patient comorbidities and the individualized treatment approaches serve as confounding factors that prevent definitive conclusions about therapeutic efficacy. The reliance on echocardiography as the primary diagnostic tool is another limitation, as its sensitivity may vary for certain thrombus locations or morphologies. Finally, the limited long-term follow-up restricts our assessment of delayed thrombotic events and late complications. Our findings, while not generalizable, can provide valuable, hypothesis-generating insights into a rare paediatric condition and highlight the spectrum of real-world clinical challenges.

Conclusion

Intracardiac thrombus is a rare but serious condition in paediatric patients associated with significant morbidity and mortality. The clinical course varies depending on the underlying aetiology and presentation, highlighting the need for multidisciplinary care. Current management is primarily extrapolated from adult data, forcing clinicians to tailor treatment individually. The heterogeneous nature of this condition underscores the need for larger, multicentre studies to clarify optimal management strategies for this vulnerable population.

Ethics

Ethical Approval: The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008, and has been approved by the institutional committee. The authors confirm that written and verbal informed consent was obtained from the legal guardians of all patients.

Footnotes

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. John JB, Cron SG, Kung GC, Mott AR. Intracardiac thrombi in pediatric patients: presentation profiles and clinical outcomes. *Pediatr Cardiol.* 2007;28:213-220.
2. Odaman AI, Oymak Y, Erdem M, Tahta N, Okur Acar S, Mese T, et al. Evaluation of clinical services and treatment outcomes of pediatric patients with intracardiac thrombosis: a single-center experience. *Blood Coagul Fibrinolysis.* 2022;33:34-41.
3. Cetin II, Ekici F, Ünal S, Kocabaş A, Sahin S, Yazıcı MU, et al. Intracardiac thrombus in children: the fine balance between risk and benefit. *Pediatr Hematol Oncol.* 2014;31:481-7.
4. Patel M, Wei X, Weigel K, Gertz ZM, Kron J, Robinson AA, et al. Diagnosis and management of intracardiac thrombus. *J Cardiovasc Pharmacol.* 2021;78:361-371.
5. Oğuz D, Öcal B, Karademir S, Demirel N, Şenocak F. Cardiac thrombi in children: A report of ten cases. *Türkiye Tıp Dergisi Dahili Tıp Bilimleri.* 1999;6:299-302.
6. Agarwal S, Abdelghani E, Stanek JR, Sankar A, Cua CL, Kerlin BA, et al. Intracardiac thrombi in pediatrics: anticoagulation approach and treatment outcomes. *Res Pract Thromb Haemost.* 2023;7:102266.
7. Ozkutlu S, Ozbarlas N, Ozme S, Saraçlar M, Göğüş S, Demircin M. Intracardiac thrombosis diagnosed by echocardiography in childhood: predisposing and etiological factors. *Int J Cardiol.* 1993;40:51-6.
8. Gülgün M, Fidancı MK, Kılıç A, Demir H, Kesik V, Demirkol S. Right atrial thrombus due to central venous catheter: a case report. *Gulhane Medical Journal.* 2015;57.
9. Monagle P, Azzam M, Bercovitz R, Betensky M, Bhat R, Biss T, et al. American Society of Hematology/International Society on Thrombosis and Haemostasis 2024 updated guidelines for treatment of venous thromboembolism in pediatric patients. *Blood Adv.* 2025;9:2587-2636.
10. Ku CJ, Yu X, Zhao QY, Grzegorski SJ, Daniel JG, Ferguson AC, et al. Loss of protein C vs protein S results in discrepant thrombotic phenotypes. *Blood Adv.* 2025;9:545-557.