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ARRHYTHMIAS DEVELOPING DURING ACUTE RHEUMATIC FEVER: A LONG-TERM SINGLE CENTRE EXPERIENCE

AKUT ROMATİZMAL ATEŞ ATAĞI SIRASINDA GELİŞEN ARİTMİLER: UZUN DÖNEM TEK MERKEZ DENEYİMİ

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ABSTRACT

Objective: This study aimed to evaluate the prevalence, types, and clinical significance of arrhythmias observed during acute rheumatic fever (ARF) episodes and their association with the severity of carditis in a single-centre paediatric cohort.

Material and Methods: A retrospective review of medical records from 118 patients diagnosed with ARF based on the revised Jones criteria was performed. Electrocardiograms (ECGs) recorded during the acute phase were analysed for arrhythmias, including atrioventricular (AV) blocks, supraventricular and ventricular arrhythmias, and conduction disturbances. Patients were stratified into mild-moderate and severe carditis groups. Statistical analyses were conducted using SPSS 26.0, with p-values<0.05 considered significant.

Results: Among the 118 patients (mean age 10.5±1.7 years; 55% female), 51.6% exhibited first-degree AV block. The other arrhythmias included second-degree AV block (4.2%), complete AV block (0.8%), supraventricular tachycardia (0.8%), non-sustained ventricular tachycardia (0.8%), and junctional rhythm (1.7%). Supraventricular and ventricular extrasystoles were identified in 4.2% and 5.9% of the patients, respectively. Most arrhythmias occurred in the mild-to-moderate carditis group and resolved spontaneously or with minimal intervention. No arrhythmias were associated with mortality or long-term complications.

Conclusion: Arrhythmias during ARF are relatively uncommon but may reflect myocardial inflammation. While typically benign and self-limiting, vigilant monitoring is essential for timely management. Further research is needed to elucidate the underlying mechanisms and optimise treatment strategies for arrhythmias in ARF.

Keywords: Rheumatic fever, arrhythmia, carditis

ÖZ

Amaç: Bu çalışma, akut romatizmal ateş (ARA) sırasında gelişen aritmilerin prevalansını, türlerini ve klinik önemini değerlendirmeyi ve bu aritmilerin kardit şiddetiyle ilişkisini incelemeyi amaçlamaktadır.

Gereç ve Yöntemler: Revize edilmiş Jones kriterlerine göre ARA tanısı konulan 118 hastanın tıbbi kayıtları retrospektif olarak incelendi. Akut dönemde kaydedilen elektrokardiyogramlar (EKG) atriyoventriküler (AV) bloklar, supraventriküler ve ventriküler aritmiler ile iletim bozuklukları açısından değerlendirildi. Hastalar hafif-orta ve şiddetli kardit gruplarına ayrıldı. İstatistiksel analizler SPSS 26.0 kullanılarak yapıldı ve $p < 0.05$ anlamlı kabul edildi.

Bulgular: Çalışmaya dahil edilen 118 hastanın (ortalama yaş 10,5±1,7 yıl; %55'i kız) %51,6'sında birinci derece AV blok tespit edildi. Diğer aritmiler arasında ikinci derece AV blok (%4,2), tam AV blok (%0,8), supraventriküler taşikardi (%0,8), "non-sustained" ventriküler taşikardi (%0,8) ve "junctional" ritim (%1,7) yer aldı. Supraventriküler ve ventriküler ekstrasistol ise sırasıyla %4,2 ve %5,9 hastada saptandı. Aritmilerin büyük çoğunluğu hafif-orta kardit grubunda görüldü ve genellikle spontan olarak veya minimal müdahale ile düzeldi. Aritmilere bağlı ölüm veya uzun dönem komplikasyon bildirilmedi.

Sonuç: ARA sırasında gelişen aritmiler nadir görülmekle birlikte, miyokardiyal inflamasyonu yansıtabilir. Genellikle iyi huylu ve kendiliğinden düzelen bu durumların zamanında tanınması ve izlenmesi önemlidir. ARA'da aritmilerin altında yatan mekanizmaların ve tedavi yaklaşımlarının optimize edilmesi için daha fazla araştırmaya ihtiyaç vardır.

Anahtar Kelimeler: Romatizmal ateş, aritmi, kardit

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INTRODUCTION

Acute rheumatic fever (ARF) is a systemic inflammatory disease that develops as a non-suppurative complication of group A beta-haemolytic streptococcal (GABHS) pharyngitis. It primarily affects the joints, skin, brain, and heart. Cardiac involvement, known as pancarditis, is a hallmark of ARF, affecting the endocardium, myocardium, and pericardium (1). Myocardial inflammation can disrupt the normal conduction system of the heart, leading to various arrhythmias (2). Arrhythmias during ARF can range from sinus tachycardia, which is commonly seen due to fever and systemic inflammation, to more severe forms such as atrioventricular block, atrial fibrillation, and ventricular arrhythmias. While first-degree atrioventricular block, manifesting as prolonged PR intervals on electrocardiography (ECG), is frequently observed and considered a minor diagnostic criterion for ARF, higher-grade blocks or other complex arrhythmias are rare but clinically significant (2, 3). The presence of arrhythmias during ARF can provide insights into the extent of myocardial involvement and may influence the disease course and management strategies. Understanding these disturbances is crucial for timely recognition, appropriate monitoring, and therapeutic intervention, thereby potentially improving patient outcomes (4).

This study aims to provides insights into the long-term experience of arrhythmias observed during ARF exacerbations in a single centre cohort. Also aims analysing the types, frequencies, and clinical significance of arrhythmias observed in ARF, emphasising the need for heightened clinical awareness and further research into this underexplored aspect of the disease. By doing so, it seeks to contribute to the growing body of literature on the cardiac manifestations of ARF and their implications for long-term management.

MATERIAL AND METHODS

This study was conducted to investigate the prevalence, types, and clinical significance of arrhythmias observed during acute rheumatic fever (ARF). A retrospective analysis was performed on the medical records of patients diagnosed with ARF based on the revised Jones criteria (Gold standard for diagnosing ARF). Data from the period when patients were diagnosed with ARF and followed up with anti-inflammatory treatment were evaluated.

Study population

Patients who were admitted to our Paediatric Cardiology Department between January 2010 and June 2024 with a confirmed diagnosis of ARF were included in this study. All patients diagnosed with acute rheumatic fever (ARF) and having carditis were included in the study. Patients with carditis were examined in two groups: mild-moderate carditis and severe carditis. Patients with single valve involvement or mild insufficiency in both valves were considered to have mild-moderate carditis, whereas cases in which significant insufficiency was detected in one or more valves were considered to have severe carditis according to the Jones criteria. Patients with missing data in their files and whose ECG could not be accessed were excluded from the study even though the diagnosis was made. The exclusion criteria also included pre-existing cardiac diseases, electrolyte imbalances, or other systemic conditions that could independently cause arrhythmias.

Data collection

The demographic data, clinical findings, laboratory results, and echocardiographic evaluations of all patients were reviewed. ECGs recorded during the acute phase of ARF were analysed for evidence of arrhythmias, including:

- Atrioventricular (AV) block (first, second, or third degree)

- Supraventricular arrhythmias (e.g., premature atrial contractions, supraventricular tachycardia)

-Ventricular arrhythmias (e.g., premature ventricular contractions, ventricular tachycardia)

- Junctional rhythm

The presence of QT interval abnormalities and other conduction disturbances was also documented.

Statistical analysis

Data was analysed using Statistical Package for Social Sciences (IBM SPSS Corp., Armonk, NY, USA) Windows 26.0 software. Continuous variables were presented as mean±standard deviation (SD), and categorical variables were presented as frequencies and percentages. Comparisons between groups (patients with and without arrhythmias) were made using the chi-square test for categorical variables and the t-test or Mann-Whitney U test for continuous variables, as appropriate. A p-value<0.05 was considered statistically significant.

Ethical considerations

This study was approved by the Istanbul Medical Faculty Clinical Research Ethics Committee (Date: 13.12.2024, No: 24). The study was conducted in accordance with the Declaration of Helsinki.

RESULTS

The research encompassed a cohort of 118 paediatric patients, which comprised 65 females (55%) and 53 males (45%), with a mean age of 10.5±1.7 years. Within this population, 61 children (51.6%) were diagnosed with first-degree AV block, which included 33 females and 28 males. As previously noted, all patients identified with ARF included in this investigation were children presenting with carditis. The diagnosis of carditis, whether silent or clinical, was established in accordance with the Jones criteria, and patients were subsequently classified as exhibiting mild, moderate, or severe carditis. Given that the established guideline prescribes anti-inflammatory treatment by categorising patients into two distinct groups-mild-moderate and severe carditis-we assessed our subjects by similarly dividing them into these two classifications. The cohort exhibiting mild-moderate carditis comprised 97 individuals (82% of the

Table 1. Characteristics of patients with (+) and without (-) first-degree atrioventricular (AV) block

Variables	Total (n=118)	First-degree AV Block (+) (n=61, 51.6%)	First-degree AV Block (-) (n=57, 48.4%)	p value
Age (years), mean±SD	10.5±1.7	10.8±1.9	10.9±1.6	0.71
Female gender, n, (%)	65 (55%)	33 (54%)	32 (56%)	0.67
Mild-Moderate Carditis, n	97	52	45	0.56
Severe Carditis, n	21	9	12	0.7
QTc (ms), mean±SD	402.2±30.1	424.4±16.3	415.5±25.1	0.65
Syncope, n	0	0	0	
Mortality, n	0	0	0	

Table 2: Major Criteria distribution of the patients

Major Criteria	Number of patients (n)	Percentage (%)
Carditis	118	100
Mild-moderate Carditis	97	82.2
Severe Carditis	21	17.8
Arthritis	84	71
Chorea	9	7.6
Eritema marginatum	3	2.5
Subcutaneous nodules	2	1.6

Table 3. Distribution of arrhythmias detected in patients based on the severity of the carditis

Arrhythmia types	Total (n)	Mild-moderate carditis (n)	Severe Carditis (n)
Complete AV block	1	1	-
2nd degree AV block	5	5	-
Mobitz type 1	3	3	-
Mobitz type 2	2	2	-
Supraventricular extrasystole	5	3	2
Ventricular extrasystole	7	4	3
Supraventricular tachycardia	1	1	-
Non-sustained ventricular tachycardia	1	1	-
Junctional rhythm	2	2	-

total patient population; 53 females and 44 males), whereas the subgroup that manifested severe carditis consisted of 21 individuals (18% of the total patients; 12 females and 9 males).

Upon the assessment of the ECG data from the cohort of patients, the measurements of the corrected QT interval (QTc) were concurrently obtained. The mean value was established at 402.2±30.1 milliseconds (ms). Statistical analysis revealed no significant difference between the average QTc values of patients exhibiting first-degree AV block and those without such a condition (Table 1).

In the assessment of the cohort of patients, all of whom presented with carditis, based on the identification of additional major criteria, it was observed that 84 patients (71%) exhibited symptoms of arthritis. The classification of arthritis adhered to the 2015 revised Jones criteria. Given that our nation is categorised within a high-risk community demographic, both polyarthritis and instances of monoarthritis, as well as polyarthralgia, were deemed to satisfy the criteria for a positive arthritis diagnosis. Sydenham's chorea was identified in 9 patients (7.6%), erythema marginatum in 3 patients (2.5%), and subcutaneous nodules in 2 patients (1.6%) (Table 2). These findings were largely consistent with the existing literature and established textbook references.

The medical records of the patients, along with the post-diagnosis therapeutic interventions and ECG data, were subjected to a retrospective analysis. The prevalence of patients exhibiting the development of arrhythmias is delineated in Table 3 and as a graphic in Figure 1. A complete AV block was identified in one patient, a second-degree Mobitz type I AV

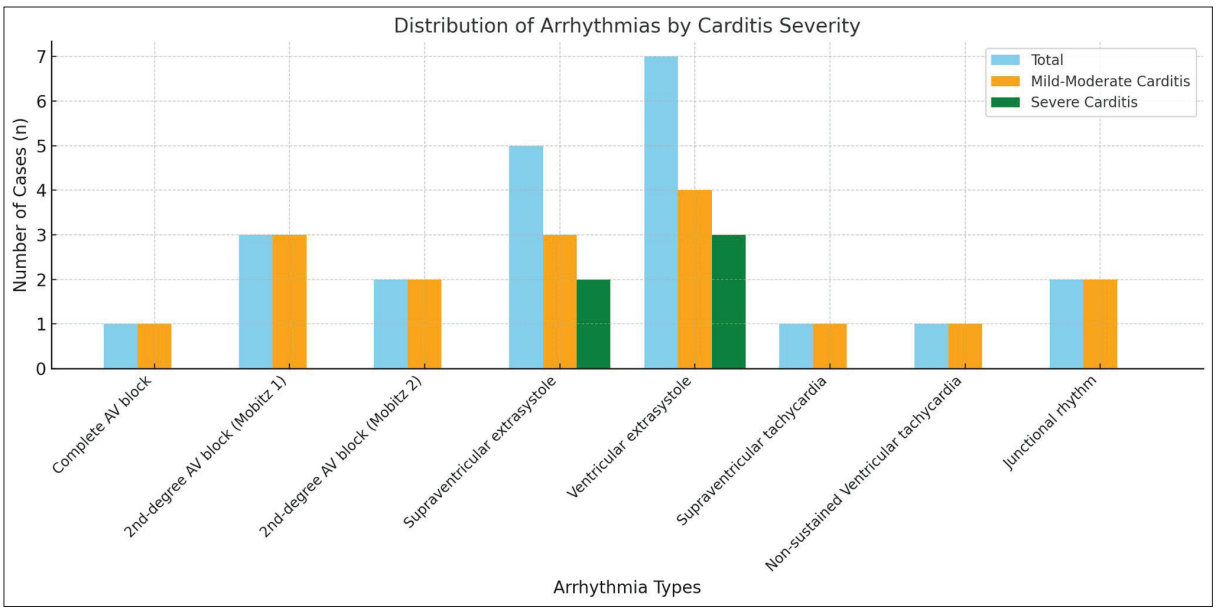

Figure 1: The types of arrhythmias by carditis severity

block was observed in three patients, and a Mobitz type II AV block was noted in two patients. All patients who manifested second- and third-degree AV blocks presented with mild to moderate carditis. Temporary pacemaker implantation was executed for the patient who experienced a complete block. The patient underwent monitoring for a duration of 1 day, after which pacing was discontinued following the resolution of the block, allowing the patient to return to a normal sinus rhythm.

Supraventricular tachycardia (SVT) was observed in one patient, non-sustained VT was noted in one patient, and junctional rhythm was recorded in two patients. The episode of SVT responded favourably to a single administration of adenosine and did not reappear. The patient diagnosed with non-sustained VT remained asymptomatic and was subsequently treated with a beta-blocker (propranolol). No recurrence of symptoms was documented during the follow-up period. The two patients presenting with junctional rhythm were also asymptomatic, and no therapeutic intervention was administered. The junctional rhythm resolved spontaneously during subsequent follow-up evaluations.

The four patients who exhibited SVT, non-sustained VT, and junctional rhythm were also those diagnosed with mild to moderate carditis. The corrected QTc value for the patient who had non-sustained VT was found to be within normal physiological limits.

Among the patients with arrhythmias identified during follow-up assessments, supraventricular extrasystole (SVE) was recorded in five individuals, whereas ventricular extrasystole (VES) was documented in seven individuals. Due to the limited number of patients with extrasystole, statistical analysis was not feasible; however, it was noted that extrasystoles were present in both patient groups, with a greater frequency observed in those with mild to moderate carditis.

DISCUSSION

Today, acute rheumatic fever continues to be one of the predominant aetiologies of acquired heart disease. Consequently, rheumatic heart disease is a significant contributor to morbidity (1). While the involvement of cardiac valves and pancarditis in rheumatic heart disease is well characterised through their pathogenesis in conjunction with clinical and imaging findings, the arrhythmias that arise during the progression of the disease are comparatively less delineated within the academic literature (4).

When assessing the association between acute rheumatic fever and the onset of arrhythmias, it is imperative to scrutinise the underlying inflammatory mechanisms that may precipitate cardiac complications. Contemporary studies have underscored the significance of elevated biomarkers such as C-reactive protein (CRP) in forecasting arrhythmic occurrences in affected individuals (2). Given that a 15-year retrospective analysis was conducted in our investigation, a numerical correlation was not performed due to the discrepancies in titres; nonetheless, acute phase reactants such as CRP and sedimentation rates were found to be positive according to the Jones criteria across all subjects.

PR prolongation on ECG, commonly referred to as first-degree atrioventricular (AV) block, constitutes a minor diagnostic criterion for acute rheumatic fever, yet it does not serve as a pathognomonic indicator of the condition. This phenomenon is observed with a prevalence of approximately 2% within the general population. The incidence among patients diagnosed with acute rheumatic fever ranges around 50% according to various literature sources (5, 6). Considering the commonality of PR prolongation in acute rheumatic fever, our retrospective study focused on the examination of other less prevalent arrhythmias.

Case series documented in the literature reveal that the arrhythmias experienced during an acute rheumatic fever episode may include second-degree and third-degree AV block, VT, and junctional rhythm (7). In our analysis, the overall rate of arrhythmias was determined to be 8.4% when factoring in SVT, VT, second-degree and third-degree AV block, as well as junctional rhythm; furthermore, when cases of supraventricular and ventricular extrasystole were included, the incidence escalated to 18.6%. This figure aligns closely with the existing literature values (2).

In the research conducted by Karacan et al., a comparative analysis of arrhythmia rates identified through standard ECG and 24-h rhythm Holter monitoring in patients with ARF revealed that arrhythmias were more frequently detected via the 24-h rhythm Holter compared to the standard ECG (accelerated junctional rhythm was observed in three patients on standard ECG, whereas it was present in nine patients-14%-during the 24-h rhythm Holter). Given that only standard ECG data were analysed in our study, the detection rate of junctional rhythm was noted to be lower (1.6%) and in another study, approximately 6% of individuals exhibited a junctional rhythm (2, 3). Furthermore, drawing upon literature insights, it would be appropriate to assert that, because junctional rhythm is typically asymptomatic, the 24-h rhythm Holter represents a superior modality for identifying such patients (3). Another characteristic of junctional rhythm is that it represents a rhythm disorder that corrects itself spontaneously and does not necessitate therapeutic intervention, as evidenced in our cases (2).

In the course of our investigation, we identified a total of six patients exhibiting advanced atrioventricular block; five patients presented with second-degree heart block: three classified as Mobitz Type 1, two as Mobitz Type 2, and one patient demonstrated complete heart block. Our rate of advanced atrioventricular block, which was ascertained to be 0.5%, was in proximity to the existing literature, where the incidence is reported to range from 1.5% to 5.5% (3-5, 7-9). There exist case reports within the existing literature that detail instances of temporary pacemaker implantation, including a case analogous to that of our patient who experienced complete atrioventricular block; however, in the majority of instances, it typically exhibits a propensity for spontaneous resolution without necessitating any form of intervention (10).

Supraventricular and ventricular extrasystoles and/or tachycardia manifesting during an acute rheumatic fever episode have been documented in few academic studies; given the occurrence of pancarditis in these individuals, it appears most plausible that these arrhythmias arise as a consequence of myocardial involvement. In our investigation, the instances that manifested SVT and non-sustained VT were characterised by mild to moderate carditis. Nevertheless, the occurrence of VT in the context of severe endocarditis affecting all four heart valves has been documented in the existing literature (11, 12).

The extant literature elucidates that advanced atrioventricular block is not uniformly correlated with valvulitis. Furthermore, an additional investigation revealed that junctional rhythms do not invariably correlate with clinical carditis. Our research corroborates their findings. Although arrhythmias constitute manifestations of cardiac involvement in rheumatic fever, they appear to arise earlier in the progression of the disease, preceding the onset of valvulitis, as evidenced by the markedly elevated levels of acute phase reactants (3, 6). Furthermore, the administration of steroid therapy to individuals diagnosed with severe carditis may exert an influence on the suppression of arrhythmias (13).

In conclusion, arrhythmias linked to ARF pose a considerable clinical challenge, often indicative of inflammatory heart involvement. The pathophysiology is mainly associated with rheumatic fever-induced cardiac damage, affecting electrical conduction. These arrhythmias are generally benign but can be life-threatening, warranting vigilant monitoring, especially in paediatric cases. Timely identification and treatment of acute rheumatic fever are vital to avert the long-term consequences of rheumatic heart disease and related arrhythmias. Continued investigation into the mechanisms and management of arrhythmias in acute rheumatic fever is critical for enhancing patient outcomes and mitigating morbidity.

Ethics Committee Approval: This study was approved by Istanbul Medical Faculty Clinical Research Ethics Committee (Date: 13.12.2024, No: 24).

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