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Clinical and laboratory markers associated with renal involvement and recurrence in children with henoch-schönlein purpura: A single-center retrospective analysis

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Abstract

Henoch-Schönlein purpura (HSP), or immunoglobulin A (IgA) vasculitis, is the most common small-vessel vasculitis in childhood, and renal involvement and disease recurrence are the main determinants of long-term outcome. This study aimed to evaluate the clinical and laboratory characteristics of children with HSP and to identify factors associated with renal involvement and disease recurrence. This single-center retrospective study included children aged 1-18 years diagnosed with HSP between January 2018 and June 2025 according to the EULAR/PRINTO/PRES criteria. Demographic, clinical, and laboratory data at diagnosis were extracted from medical records. Renal involvement was defined as the presence of microscopic hematuria and/or proteinuria. Disease recurrence was defined as reappearance of HSP manifestations after a symptom-free period of at least four weeks. A total of 102 children (66.7% male, mean age 8.0 ± 2.9 years) were included. Renal involvement was detected in 32 patients (31.4%), and recurrence occurred in 10 patients (9.8%). Hemoglobin levels were significantly lower in patients with renal involvement compared with those without (12.7 ± 1.2 vs 13.4 ± 1.4 g/dL, p=0.012), while C-reactive protein (CRP) levels were higher, although not reaching statistical significance (2.6 ± 3.2 vs 1.4 ± 1.7 mg/L, p=0.053). CRP showed limited ability to discriminate renal involvement (AUC=0.62). No clinical or laboratory parameter independently predicted disease recurrence in multivariate analysis. Renal involvement occurred in approximately one-third of children with HSP and was associated with lower hemoglobin levels and higher CRP values, reflecting increased inflammatory burden. However, CRP demonstrated limited predictive value, and no single laboratory marker reliably predicted renal involvement or recurrence. Children with systemic involvement may benefit from closer follow-up, and larger prospective studies are needed to develop more accurate predictive models.

Keywords: Henoch-schönlein purpura, iga vasculitis, renal involvement, recurrence, children, c-reactive protein

Introduction

Henoch-Schönlein purpura (HSP), currently termed immunoglobulin A (IgA) vasculitis, is the most common small-vessel vasculitis in childhood and is characterized by IgA-dominant immune complex deposition in vessel walls [1,2]. It typically presents with palpable purpura without thrombocytopenia and may involve the skin, joints, gastrointestinal tract, and kidneys [1-3]. Although the disease is self-limited in most children, systemic involvement may result in clinically relevant morbidity [2,3].

The clinical course of IgA vasculitis differs between children and adults. Pediatric disease is generally milder, whereas adult-onset cases show a higher frequency of renal involvement and long-term sequelae [4,5]. Nevertheless, renal manifestations remain a major concern in childhood and may range from isolated microscopic hematuria to progressive nephritis [6,7].

Renal involvement and disease recurrence are the main determinants of long-term prognosis in pediatric IgA vasculitis. Renal involvement has been reported in approximately 20-50% of cases and is associated with an increased risk of persistent proteinuria and chronic kidney disease [6-8]. Disease recurrence further contributes to cumulative inflammatory burden and may negatively affect outcomes [9].

Several clinical and laboratory parameters have been investigated as potential predictors of renal involvement and recurrence;

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however, findings remain inconsistent, and no single laboratory marker has demonstrated sufficient predictive accuracy at diagnosis [6,10].

Therefore, identifying simple and reliable indicators associated with renal involvement and disease recurrence remains a clinical challenge. In this study, we aimed to evaluate the clinical and laboratory characteristics of children with Henoch-Schönlein purpura and to investigate factors associated with renal involvement and disease recurrence in a pediatric cohort.

Material and Methods

Study Design

This study was designed as a single-center, retrospective observational study conducted in the Pediatrics Clinic of Malatya Training and Research Hospital. Medical records of children diagnosed with Henoch-Schönlein purpura (HSP) between January 2018 and June 2025 were reviewed. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Ethical approval was obtained from the Malatya Turgut Özal University Non-Interventional Clinical Research Ethics Committee (No: E-30785963-020-285835; Date: 17.02.2025; Application No: 2025/6). Due to the retrospective design and anonymized nature of the data, informed consent was not required.

Participants

Children aged 1-18 years who were diagnosed with HSP according to the European League Against Rheumatism / Pediatric Rheumatology International Trials Organisation / Pediatric Rheumatology European Society (EULAR/PRINTO/PRES) 2010 classification criteria were eligible for inclusion [11,12]. These criteria require the presence of palpable purpura predominantly involving the lower extremities without thrombocytopenia, together with at least one of the following: gastrointestinal involvement, joint involvement, renal involvement, or histopathological evidence of IgA deposition.

A total of 268 patient records were initially screened. Patients were excluded if they did not fully meet the EULAR/PRINTO/PRES criteria or were diagnosed with another form of vasculitis, were older than 18 years, had missing laboratory or follow-up data, had malignancy, immunodeficiency, or chronic systemic disease, or had received systemic corticosteroid therapy prior to diagnostic evaluation. After exclusion, 102 patients with complete clinical and laboratory data were included in the final analysis. The patient selection process is shown in Figure 1.

Data Collection

Demographic data (age, sex), date and season of admission, length of hospital stay, duration of follow-up, and occurrence of disease recurrence were recorded. Clinical findings at presentation included palpable purpura, joint involvement (arthralgia and/or arthritis), gastrointestinal system involvement (abdominal pain, vomiting, and/or diarrhea), and renal manifestations.

Laboratory parameters obtained at the time of diagnosis, before initiation of systemic corticosteroid therapy, included hemoglobin level, leukocyte and platelet counts, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), serum creatinine, antistreptolysin-O (ASO), serum IgA level (when available), neutrophil-to-lymphocyte ratio (NLR), and urinalysis findings. All laboratory analyses were performed in laboratories accredited according to ISO 15189 standards.

Definitions

Renal involvement was defined as the presence of microscopic hematuria and/or proteinuria on urinalysis. Microscopic hematuria was defined as ≥5 red blood cells per high-power field. Proteinuria was defined as a urine dipstick result of ≥1+ or an elevated spot urine protein-to-creatinine ratio when available. Renal biopsy was not routinely performed; therefore, histopathological data were not included in the analysis.

Gastrointestinal involvement was defined as the presence of abdominal pain, vomiting, and/or diarrhea attributable to HSP.

Disease recurrence (relapse) was defined as the reappearance of any HSP-related clinical manifestation after a symptom-free period of at least four weeks. In patients with multiple relapses, only the first relapse was considered for statistical analysis.

Seasonal distribution was determined based on the date of first hospital admission and classified as spring, summer, autumn, or winter.

Seasonal classification was included because IgA vasculitis is known to show seasonal variation, with higher incidence reported during autumn and winter months, which is thought to be related to the increased frequency of upper respiratory tract infections during these periods. Evaluating seasonal distribution therefore provides epidemiological insight into potential environmental and infectious triggers of disease onset.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Normality of continuous variables was assessed using the Shapiro-Wilk test. Normally distributed variables were expressed as mean ± standard deviation, while non-normally distributed variables were expressed as median (interquartile range). Categorical variables were presented as numbers and percentages.

Comparisons between groups were performed using the Student's t-test or Mann-Whitney U test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as appropriate. Bonferroni correction was applied when necessary. Missing data were not imputed; cases with missing values were excluded from analyses involving the relevant variable.

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Spearman's rho was used for correlation analyses. Binomial logistic regression analysis was performed to identify variables associated with renal involvement and disease recurrence. Model calibration was assessed using the Hosmer-Lemeshow goodness-of-fit test, and model explanatory power was expressed using Nagelkerke R^2. Receiver operating characteristic (ROC) curve analysis was used to evaluate diagnostic performance, and the area under the curve (AUC) was calculated. A p-value <0.05 was considered statistically significant.

Missing data were limited and primarily involved serum IgA levels, which were unavailable in 14 patients (13.7%). All other clinical and laboratory variables had less than 5% missing data. Analyses were performed using complete-case analysis for each variable, and cases with missing values were excluded only from analyses involving the respective variable.

Results

Demographic and Clinical Characteristics

A total of 102 children diagnosed with HSP were included in the study. The mean age was 8.0 ± 2.86 years (range: 3-16 years). Sixty-eight patients (66.7%) were male and 34 (33.3%) were female. The mean length of hospital stay was 6.69 ± 3.69 days. Recurrence occurred in 10 patients (9.8%). Baseline demographic and clinical characteristics are presented in Table 1.

All patients had palpable purpura at presentation (100%). Abdominal pain was present in 62 patients (60.7%), joint involvement in 45 (44.1%), vomiting in 3 (2.9%), diarrhea in 2 (2.0%), and leg pain in 4 (3.9%). Renal involvement was detected in 32 patients (31.4%) (Table 2).

Seasonal Distribution

The seasonal distribution of admissions was as follows: winter in 35 patients (34.3%), autumn in 29 (28.4%), spring in 24 (23.5%), and summer in 14 (13.7%) (Table 3).

Factors Associated with Recurrence

Recurrence occurred in 10 patients (9.8%). The mean age of patients with recurrence was 7.3 ± 2.5 years, compared with 8.1 ± 2.9 years in those without recurrence (p=0.530). Among patients with recurrence, 4 were male and 6 were female, whereas among patients without recurrence, 64 were male and 28 were female (p=0.126).

Joint involvement was observed in 40.0% of patients with recurrence and 44.6% of those without recurrence (p=1.000). Gastrointestinal involvement was present in 70.0% of patients with recurrence and 63.0% of those without recurrence (p=0.095). Renal involvement was detected in 50.0% of patients with recurrence and 29.3% of those without recurrence (p=0.328). Laboratory parameters according to recurrence status are summarized in Table 4.

Laboratory Parameters According to Gastrointestinal Involvement

Gastrointestinal involvement was present in 67 patients (65.6%). The mean CRP level was 1.9 ± 2.6 mg/L in patients with gastrointestinal involvement and 1.6 ± 1.8 mg/L in patients without gastrointestinal involvement (p=0.744). Leukocyte counts were 11.605.9 ± 3.519.9 /mm³ and 11.602.4 ± 3.059.2 /mm³, respectively (p=0.671). Mean hemoglobin levels were 12.8 ± 1.3 g/dL in patients with gastrointestinal involvement and 13.1 ± 1.3 g/dL in those without (p=0.484). Platelet counts were 374,959.7 ± 114,183.6 /mm³ and 351,985.0 ± 95,335.0 /mm³, respectively (p=0.441) (Table 5).

Laboratory Parameters According to Renal Involvement

Renal involvement was present in 32 patients (31.4%). The mean hemoglobin level was 12.7 ± 1.2 g/dL in patients with renal involvement and 13.4 ± 1.4 g/dL in those without renal involvement (p=0.012). The mean CRP level was 2.6 ± 3.2 mg/L in the renal involvement group and 1.4 ± 1.7 mg/L in the non-renal involvement group (p=0.053). Leukocyte counts were 11.773.2 ± 2,548.2 /mm³ and 11.527.4 ± 3.647.8 /mm³, respectively (p=0.334). Platelet counts were 361.490.6 ± 77.485.2 /mm³ and 367.988.6 ± 118.905.5 /mm³, respectively (p=0.697) (Table 6).

Correlation Analysis

Spearman correlation analysis showed a weak negative correlation between CRP and hemoglobin (ρ=-0.211; p=0.0337). A weak positive correlation was observed between CRP and platelet count (ρ=0.245; p=0.0130), and a moderate positive correlation between leukocyte and platelet counts (ρ=0.322; p=0.0010).

ROC Analysis

ROC curve analysis was performed to evaluate the ability of CRP to discriminate renal involvement. The area under the curve (AUC) was 0.62 (Figure 2).

Logistic Regression Analysis

In the logistic regression model for recurrence, age, gastrointestinal involvement, joint involvement, CRP level, and renal involvement were included as independent variables. None of the variables reached statistical significance. The odds ratio for recurrence was 5.39 for gastrointestinal involvement and 2.16 for renal involvement. Model calibration assessed by the Hosmer-Lemeshow test was p=0.41, and the Nagelkerke R^2 was 0.13.

Table 1. Demographic and clinical characteristics of patients with HSP

Variable	Value
Average age (years)	8.0 ± 2.86 (min:3 - max:16)
Gender (boy/girl)	68 (%66.7)/ 34(%33.3)
Average length of stay (days)	6.69 ± 3.69
Recurrence rate (%)	9.8%

Data are given as number (n) and percentage (%)

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Table 2. General distribution of clinical findings in patients with HSP

Clinical findings	Number of patients (n)	Rate (%)
Rash	102	100.0
Abdominal pain	62	60.7
Joint pain	45	44.1
Vomiting	3	2.9
Diarrhea	2	2.0
Leg pain	4	3.9

Data are given as number (n) and percentage (%)

Table 3. Seasonal distribution of seasonal admission in HSP cases

Season	Number of patients (n)	Rate (%)
Winter	35	34.3
Autumn	29	28.4
Spring	24	23.5
Summer	14	13.7
Total	102	100

Data are presented as number (n) and percentage (%)

Table 4. Factors associated with relapse

Variable	Relapsing (10)	Relapse free (92)	p-value
Age	7.3 ± 2.5	8.1 ± 2.9	0.530
Gender (M/F)	4/6	64/28	0.126
Joint Involvement	4 (40.0%)	41 (44.6%)	1.000
GIS Involvement	7 (70.0%)	58 (63.0%)	0.095
Renal Involvement	5 (50.0%)	27 (29.3%)	0.328
CRP (mg/L)	2.3 ± 4.6	1.7 ± 1.9	0.588
Leukocytes (10^3/μL)	13822.4 ± 5803.9	11363.4 ± 2895.7	0.214
Platelets (10^3/μL)	354150.0 ± 108941.4	367232.6 ± 107634.4	0.593

Mann-Whitney U test was used for continuous variables and Chi-square test was used for categorical variables

Table 5. Laboratory parameters according to the presence of GIS involvement

Parameter	No GIS involvement (n=35)	GIS involvement (n=67)	p-value
CRP (mg/L)	1.6 ± 1.8	1.9 ± 2.6	0.744
Leukocytes (/mm^3)	11602.4 ± 3059.2	11605.9 ± 3519.9	0.671
Hemoglobin (g/dL)	13.1 ± 1.3	12.8 ± 1.3	0.484
Platelet (/mm^3)	351985.0 ± 95335.0	374959.7 ± 114183.6	0.441

Mann-Whitney U test was used for continuous variables

Table 6. Laboratory parameters according to renal involvement

Parameter	No renal involvement (n=77)	Renal involvement (n=32)	p-value
Hemoglobin (g/dL)	13.4 ± 1.4	12.7 ± 1.2	0.012
CRP (mg/L)	1.4 ± 1.7	2.6 ± 3.2	0.053
Leukocytes (/mm^3)	11527.4 ± 3647.8	11773.2 ± 2548.2	0.334
Platelet (/mm^3)	367988.6 ± 118905.5	361490.6 ± 77485.2	0.697

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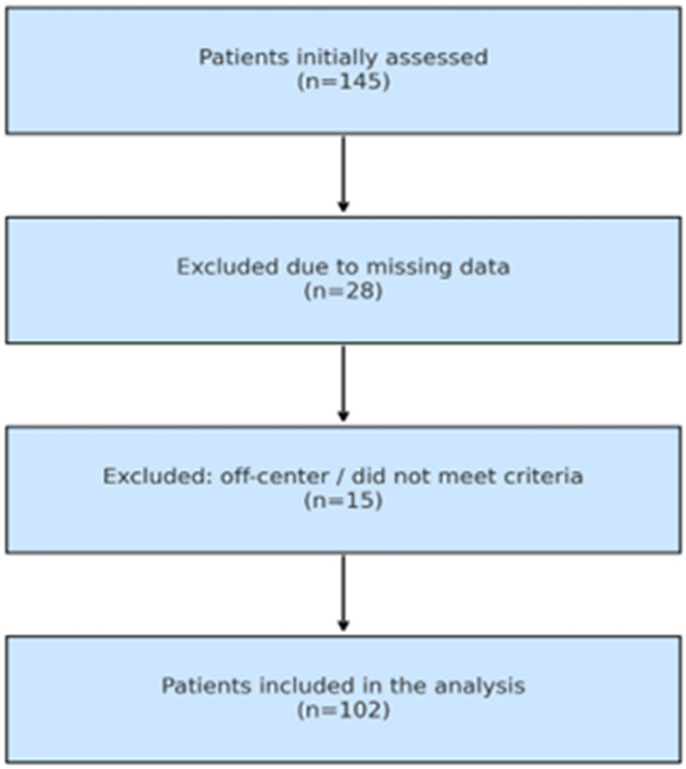

Figure 1. Patient flow diagram

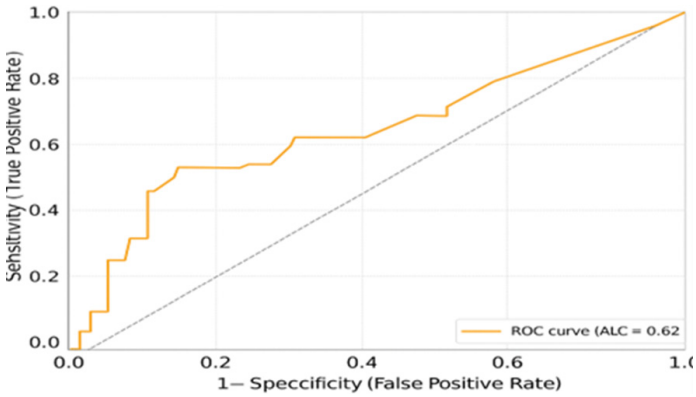

Figure 2. In the ROC analysis, CRP was found to have limited discriminatory power in terms of renal involvement (AUC: 0.62; p=0.048). This value, although statistically significant, indicates that CRP alone is not a strong biomarker

Discussion

Renal involvement is widely recognized as the most important determinant of long-term prognosis in pediatric IgA vasculitis. In the present study, renal involvement was detected in approximately one-third of patients, a finding that is consistent with previously reported rates in pediatric cohorts, which range from 20% to 50% [13-15]. Although renal manifestations in childhood are often mild and self-limited, a subset of patients may progress to persistent proteinuria or chronic kidney disease, underscoring the need for early identification of higher-risk patients [16,17].

In our cohort, children with renal involvement had significantly lower hemoglobin levels compared with those without renal findings. Anemia in IgA vasculitis has been associated with increased systemic inflammation, impaired erythropoiesis mediated by inflammatory cytokines, and, in some cases, occult gastrointestinal blood loss [18,19]. Previous studies have similarly reported lower hemoglobin levels in patients with more severe or systemic disease, supporting the interpretation that anemia reflects overall disease burden rather than isolated renal pathology [18,20].

C-reactive protein levels were higher in patients with renal involvement, although the difference reached only borderline statistical significance. This finding aligns with earlier reports suggesting that elevated inflammatory markers may accompany renal or gastrointestinal involvement in IgA vasculitis [18,20]. However, ROC analysis demonstrated limited discriminative ability of CRP for renal involvement (AUC=0.62), indicating that CRP alone is insufficient as a predictive marker. This observation is consistent with previous pediatric studies and systematic reviews showing that single inflammatory markers have limited prognostic accuracy and should not be used in isolation for risk stratification [21,22].

The correlations observed between CRP, hemoglobin, and platelet counts further support the role of systemic inflammation in IgA vasculitis. The inverse relationship between CRP and hemoglobin and the positive association between CRP and platelet count are consistent with inflammation-related anemia and reactive thrombocytosis, which have been described in vasculitic and inflammatory conditions [18,20]. These findings suggest that routine hematological parameters may provide indirect information regarding disease activity, although their specificity for renal involvement remains limited.

Disease recurrence was observed in 9.8% of patients in the present study, which is within the lower range of relapse rates reported in pediatric IgA vasculitis [14,17]. While some studies have documented higher recurrence rates, particularly in cohorts with longer follow-up durations or more severe initial disease, lower rates have also been reported in pediatric populations with predominantly mild disease courses [17,22]. In our analysis, gastrointestinal involvement and renal involvement were associated with increased odds of recurrence, although these associations did not reach statistical significance in multivariate analysis.

The absence of statistically significant predictors of recurrence may be explained by the relatively small number of relapsed patients, which limited the statistical power of the regression model. Nevertheless, the magnitude of the observed odds ratios suggests a potential association between systemic disease burden and disease reactivation. Similar trends have been reported in previous studies, where gastrointestinal bleeding, renal involvement, or higher inflammatory markers were linked to relapse but did not consistently emerge as independent predictors [14,17].

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Our findings highlight the ongoing challenges in identifying reliable predictors of renal involvement and recurrence in pediatric IgA vasculitis. Despite numerous proposed clinical and laboratory markers, results across studies remain heterogeneous, likely due to differences in study design, patient characteristics, definitions of renal involvement and relapse, and follow-up duration [21,22]. These inconsistencies emphasize the need for cautious interpretation of individual biomarkers and support a comprehensive clinical approach that integrates both clinical features and laboratory findings.

Several limitations of this study should be acknowledged. Its retrospective design limits data completeness and precludes standardized assessment of disease severity and treatment response. Renal biopsy was not routinely performed, preventing histopathological correlation of renal involvement. In addition, detailed information regarding relapse timing and patterns was not available for all patients. Finally, the relatively small number of patients with recurrence reduced the statistical power of multivariate analyses. Similar methodological limitations have been noted in previous retrospective pediatric IgA vasculitis studies [14,17].

Despite these limitations, this study provides contemporary real-world data on pediatric IgA vasculitis and reinforces the association between systemic inflammation and renal involvement. The findings suggest that lower hemoglobin levels and elevated CRP values reflect increased disease burden and may help identify children who warrant closer clinical follow-up. However, given the limited predictive value of individual laboratory markers, prospective multicenter studies with larger cohorts are needed to develop more robust predictive models for renal involvement and disease recurrence in pediatric IgA vasculitis [21,22].

Strengths and Limitations

Strengths

This study provides updated single-center data on pediatric IgA vasculitis and includes a comprehensive evaluation of both clinical and laboratory parameters. The simultaneous assessment of renal involvement and disease recurrence in the same cohort allowed exploration of two clinically relevant outcomes. In addition, the use of correlation analysis, logistic regression, and ROC curve analysis provided a multidimensional evaluation of inflammatory and hematological markers.

Limitations

This study has several limitations. First, its retrospective design limited the availability and completeness of some clinical data. Second, detailed information regarding the timing, frequency, and clinical patterns of relapse could not be obtained for all patients. Third, renal biopsy data were not available, preventing histopathological correlation of renal involvement. Fourth, the small number of patients with recurrence reduced the statistical power of multivariate analyses. Finally, the single-center nature of the study limits the generalizability of the findings.

Conclusion

This study evaluated clinical and laboratory factors associated with renal involvement and recurrence in children with Henoch-Schönlein purpura. Lower hemoglobin levels and higher CRP levels were associated with renal involvement, while gastrointestinal and renal manifestations tended to increase the likelihood of recurrence, although these associations did not reach statistical significance in multivariate analyses.

CRP demonstrated limited discriminative ability for identifying renal involvement, indicating that it should not be used as a single marker for clinical decision-making. Instead, laboratory findings should be interpreted in conjunction with clinical features when assessing disease severity and follow-up strategies.

Given the retrospective design and the limited number of relapsed patients, these findings should be interpreted with caution. However, they suggest that children with systemic involvement, particularly gastrointestinal or renal manifestations, may represent a subgroup that could benefit from closer clinical observation during follow-up.

Future prospective and multicenter studies with larger cohorts are needed to better define predictive models for renal involvement and recurrence in pediatric IgA vasculitis.

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Ethical Approval

Approved by the Malatya Turgut Özal University Non-Interventional Clinical Research Ethics Committee (No: E-30785963-020-285835; Date: 17.02.2025; Application No: 2025/6).

Informed Consent

Informed consent was waived due to the retrospective design.

Conflict of Interest

The authors declare no conflict of interest.

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