ORIGINAL RESEARCH
General Urology

Doi: 10.4274/jus.galenos.2025.2024-12-11
J Urol Surg 2025;12(1):6-13

Investigation of Clinical and Hematological Parameters Predicting Organ Loss in Testicular Torsion

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What's known on the subject? and What does the study add?

In testicular torsion, which causes physical and psychological damage, the duration of symptoms and the increase in the degree of torsion are the main parameters that cause testicular loss. However, the discussions on the cut-off points of these parameters continue. In this study, we tried to determine the cut-off points of these parameters and also tried to determine the value of new hematological parameters that have not been investigated before in predicting testicular loss.

Abstract

Objective: In this study, we aimed to determine clinical and hematological parameters that may predict testicular viability or testicular loss in patients diagnosed with testicular torsion and undergoing scrotal exploration.

Materials and Methods: Our study included 98 patients aged 1-25 years diagnosed with testicular torsion. Two groups were formed: the testicular salvage group and the unsuccessful testicular salvage group. Demographic, clinical, and hematological parameters of the two groups were compared.

Results: While 52 patients were considered successful testicular salvage, 46 patients were grouped as unsuccessful. Symptom duration and torsion degree were significantly higher in the unsuccessful testicular salvage group than in the successful testicular salvage group ($p<0.001$, respectively). White blood cell, neutrophil, monocyte, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, monocyte-to-lymphocyte ratio, systemic immune-inflammation index, systemic inflammation response index (SIRI), and aggregate index of systemic inflammation (AISI) values were significantly higher in the unsuccessful testicular salvage group ($p=0.001$, $p<0.001$, $p=0.016$, $p=0.002$, $p=0.012$, $p=0.001$, $p=0.001$, $p<0.001$, and $p<0.001$, respectively). The most important predictors for successful testicular salvage were symptom duration and degree of torsion. In the successful salvage of testicular torsion, the threshold for symptom duration was established at 9 hours, while the maximum torsion degree tolerated was set at 270°. Furthermore, $2.21\times10^3/\mu L$ for SIRI and $635.59\times10^6/\mu L^2$ for AISI were determined as the limit values predicting organ loss.

Conclusion: In our study, we found that the most important parameters in predicting organ loss in testicular torsion were the degree of torsion and symptom duration. Hematological parameters in testicular torsion patients may help predict the need for scrotal exploration and potential outcomes such as orchiectomy or testicular atrophy.

Keywords: Testicular torsion, orchidopexy, orchiectomy, haematological tests

Introduction

Testicular torsion is an urgent urological condition characterized by reduced blood flow to the testicle due to the rotation of the testicle and epididymis. Urgent intervention is required to protect the viability of the testicle and prevent testicular loss (1).

The incidence of testicular torsion has been reported to be 1 in 4.000 among male patients up to 25 years of age (2). The critical period to save the testicle after the onset of pain in testicular torsion is 4-8 hours (3). The risk of testicular loss increases with each hour passed. It is 5% within the first 6 hours, 40% after 12 hours, and 80% after 24 hours (4). The most commonly

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Received: 31.12.2024 **Accepted:** 01.02.2025 **Publication Date:** 21.02.2025

Cite this article as: Gerçek O, Şenkol M, Ulusoy K, Topal K, Yazar VM. Investigation of clinical and hematological parameters predicting organ loss in testicular torsion. J Urol Surg. 2025;12(1):6-13.

used imaging method in the differential diagnosis of testicular torsion is scrotal color Doppler ultrasonography (CDUS), which has high sensitivity and specificity (5).

In the literature, studies examine clinical parameters such as symptom duration and the degree of cord rotation, which predict testicular viability before surgery (6,7). However, most of these studies did not evaluate testicular atrophy, which develops after orchidopexy and is considered unsuccessful testicular salvage. Based on the data obtained in these studies, it can be said that symptom duration and the degree of spermatic cord rotation are significant parameters affecting testicular viability (7,8).

It has been shown that systemic inflammatory markers may increase with hypoxic tissue damage occurring in testicular torsion (9,10). In some studies, hematological parameters of systemic inflammation have been used in the differential diagnosis of epididymo-orchitis and testicular torsion (11,12). A limited number of studies have also used hematological parameters to predict testicular viability in testicular torsion (13,14).

The aim of this study was to identify clinical and hematological parameters that can predict testicular viability or testicular loss in patients diagnosed with testicular torsion who undergo scrotal exploration.

Materials and Methods

The study was conducted at the Urology Clinic of Afyonkarahisar Health Sciences University. Following ethical approval from the Clinical Research Ethics Committee of Afyonkarahisar Health Sciences University (2011-KAEK-2, 2024/2, date: 19.04.2024) the data were collected retrospectively. The study was carried out in accordance with the principles of the Helsinki Declaration.

The study included patients who visited the Department of Urology at the Afyonkarahisar Health Sciences University between April 2012 and April 2023, with testicular pain, diagnosed with testicular torsion through examination and CDUS. Symptoms in infant patients were restlessness, crying, and swelling in the testicle. CDUS was performed on all patients before the operation. All patients underwent scrotal exploration, with the diagnosis of testicular torsion confirmed Testicular viability was confirmed using the three-grade bleeding test recommended by Arda and Ozyaylali (15). Patients between the ages of 1 and 25 were included in the study.

Appendiceal testicular torsion, signs of epididymo-orchitis, any malignancy, receiving chemotherapy, hematological disease, hepatic or renal failure, other infection sites, partial blood flow to the testicle, and other testicular pathologies (cryptorchidism, etc.) were the exclusion criteria. Patients with significant differences in testicular volumes, either on preoperative physical examination or CDUS, and patients with clinical varicocele were not included in the study.

A total of 117 patients were included in the study. Twelve patients who did not attend follow-ups regularly for at least 6 months or whose testicular volume was not measured by CDUS were excluded from the study. Additionally, seven patients whose testicular torsion was not confirmed during scrotal exploration were excluded. Thus, the study proceeded with a total of 98 patients. Demographic and clinical data such as age, time from the onset of pain to the operation, seasonality, laterality, CDUS findings (degree of torsion, testicular volume, etc.), and preoperative hemogram values were recorded. The degree of torsion was calculated as rotation measured on CDUS. Symptom duration was the time from the onset of symptoms until the testicle was exposed during exploration. Patients who showed a volume difference of more than 50% between the affected testicle and the contralateral testicle on postoperative CDUS were classified as having testicular atrophy and were included in the unsuccessful testicular salvage group (16,17).

Preoperative complete blood count (CBC) parameters of the patients such as white blood cell (WBC), neutrophil, leymphocyt, monocyte, basophil, eosinophil, haemoglobin, platelet, mean corpuscular volume, mean platelet volume (MPV), platelet distribution width, red cell distribution width (RDW)-coefficient of variation, RDW-standard deviation values were measured. Furthermore, the values of the systemic inflammatory markers obtained from CBC parameters such as neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), monocyte-to-lymphocyte ratio (MLR) and monocyte-to-platelet ratio, systemic immune-inflammation index (SII) (neutrophil*platelet to lymphocyte ratio), systemic inflammation response index (SIRI) (neutrophil*monocyte to lymphocyte ratio), aggregate index of systemic inflammation (AISI) (neutrophil*platelet*monocyte to lymphocyte ratio) were calculated.

As a result, two groups were formed: the successful testicular salvage group, in which orchidopexy was performed, and no more than 50% atrophy was detected compared to the contralateral testicle, and the unsuccessful testicular salvage group, in which orchiectomy was performed, or more than 50% testicular atrophy was detected during follow-up after orchidopexy. Demographic, clinical, and hematological parameters of the two groups were compared.

Statistical Analysis

A statistical program (SPSS for Windows, v21) was used for data analysis. The Kolmogorov-Smirnov test, histogram, and skewness-kurtosis coefficients were used to evaluate whether the data had a normal distribution. Nominal and ordinal variables were compared using the Pearson chi-square test or

Fisher's exact test. The Student's t-test was used for normally distributed variables, while the Mann-Whitney U test was used for parameters that did not have a normal distribution. Independent predictors of organ loss in testicular torsion were examined with the binary logistic regression analysis. Receiver operating characteristic (ROC) curve analysis was used to assess the diagnostic decision-making abilities of clinical and hematological parameters in predicting testicular loss. A value of $p<0.05$ was accepted as statistically significant.

Results

While 67 (68.4%) of the 98 patients in the study underwent orchidopexy, the remaining 31 (31.6%) underwent orchiectomy. During follow-ups, 15 (22.4%) of the 67 patients who underwent orchidopexy showed more than a 50% reduction in the affected testicle compared to the contralateral testicular volume. These 15 patients were also included in the unsuccessful testicular salvage group along with those who underwent orchiectomy. As a result, 52 (53.1%) patients were classified as successful testicular salvage, while 46 (46.9%) were classified as unsuccessful.

The mean age of all patients was 15.37±5.45 years, with no significant difference between the groups (p=0.398). Testicular torsion was found on the left side in 62 (63.3%) patients. There was no difference between the groups in terms of the side of torsion and seasonality (p=0.530 and p=0.738, respectively) (Table 1). The follow-up period of all patients ranged from 6 to 48 months. The median follow-up period was 11 months in the detorsion group and 12 months in the orchiectomy group.

The median symptom duration was 5.5 hours in the successful testicular salvage group, which was statistically significantly lower than in the unsuccessful group (p<0.001). The median degree of torsion was 180° in the successful testicular salvage group and 360° in the unsuccessful testicular salvage group, with a statistically significant difference (p<0.001) (Table 1). In addition, the median symptom duration of 15 patients who developed testicular atrophy after detorsion was 17 hours; and the median torsion degree was 360 degrees.

When hematological parameters were analyzed between the groups, WBC, neutrophil, monocyte, NLR, PLR, MLR, SII, SIRI, and AISI values were statistically significantly higher in the testicular salvage failure group. There were no significant differences between the groups in other hematological parameters (Table 1).

Multivariate binary logistic regression analysis was used to identify the possible independent predictors of organ loss in testicular torsion that contributed the most to the outcome. Symptom duration, degree of torsion, WBC, neutrophil, monocyte, NLR, PLR, MLR, SII, SIRI, and AISI values were used as predictors. The model predicting organ loss in testicular torsion was found to fit the data well [Hosmer-Lemeshow test: $\chi^2(8)=8.7$, p=0.364] and could explain 62.1% of the variance (Nagelkerke $R^2=0.621$). The model correctly predicted 88.5% of successful salvages and 80.4% of unsuccessful salvages (84.7% in total). The success of testicular salvage in cases of testicular torsion was strongly related to the symptom duration and the degree of torsion (p=0.001 and p=0.029, respectively) (Table 2).

Table 1. Comparison of demographic and clinical data of the groups

	Successful salvage (n=52) n (%)	**Unsuccessful salvage (n=46) n (%)**	**p**
Age (years)	15.81±4.49	14.87±6.38	0.398
Laterality			
Right	21 (40.4)	15 (32.6)	0.530
Left	31 (59.6)	31 (67.4)	
Symptom duration (h)	5.5 (3-8)*	16 (10-48)*	**<0.001**
Torsion degree (°)	180 (112.5-360)*	360 (360-540)*	**<0.001**
Seasonality			
Winter	17 (32.7)	14 (30.4)	0.738
Spring	11 (21.2)	9 (19.6)	
Summer	12 (23.1)	8 (17.4)	
Autumn	12 (23.1)	15 (32.6)	
WBC count (×10³/µL)	9.71±3.08	12.49±4.66	**0.001**
Neutrophil count (×10³/µL)	6.44±3.03	9.24±4.44	**<0.001**
Lymphocyte count (×10³/µL)	2.45±1.12	2.11±0.92	0.108
Monocyte count (×10³/µL)	0.62±0.31	0.84±0.44	**0.016**

Table 1. Comparison of demographic and clinical data of the groups			
	Successful salvage (n=52) n (%)	**Unsuccessful salvage (n=46) n (%)**	**p**
Basophil count (×10³/μL)	0.035±0.024	0.070±0.18	0.241
Eosinophil count (×10³/μL)	0.11±0.10	0.09±0.11	0.169
Hemoglobin level (g/dL)	14.56±1.52	14.30±1.31	0.364
Platelet count (×10³/μL)	273.80±59.48	293.71±94.11	0.662
MCV (fL)	83.46±3.94	85.32±6.01	0.072
MPV (fL)	9.49±1.16	9.13±1.26	0.151
PDW (fL)	12.23±2.59	13.16±2.84	0.111
RDW-CV (%)	13.20±0.77	13.26±0.99	0.760
RDW-SD (fL)	39.32±2.08	39.97±2.84	0.268
NLR (%)	3.46±2.79	5.56±4.36	**0.002**
PLR (%)	136.83±81.11	158.53±67.50	**0.012**
MLR (%)	0.28±0.15	0.46±0.29	**0.001**
MPR (%)	0.0024±0.0012	0.0030±0.0016	0.085
SII (×10³/μL)	920.41±754.33 697.09 (373.82-1151.58)*	1528.20±67.50 1253.96 (770.54-1828.50)*	**0.001**
SIRI (×10³/μL)	1.94±1.66 1.56 (0.75-2.32)*	5.12±6.18 3.47 (1.61-6.39)*	**<0.001**
AISI (×10⁶/μL²)	508.39±416.06 404.87 (191.52-664.32)*	1463.04±1718.25 1154.75 (501.44-1553.59)*	**<0.001**

*: Median (25-75 percentiles), WBC: White blood cell, MCV: Mean corpuscular volume, MPV: Mean platelet volume, PDW: Platelet distribution width, RDW-CV: Red cell distribution width-coefficient of variation, RDW-SD: Red cell distribution width-standard deviation, NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, MLR: Monocyte-to-lymphocyte ratio, MPR: Monocyte-to-platelet ratio, SII: Systemic immune-inflammation index (neutrophil*platelet to lymphocyte ratio), SIRI: Systemic inflammation response index (neutrophil* monocyte to lymphocyte ratio), AISI: Aggregate index of systemic inflammation (neutrophil*platelet* monocyte to lymphocyte ratio)

Table 2. Multivariate logistic regression analysis of parameters predicting organ loss in testicular torsion		
Risk factor	**Unsuccessful salvage**	
	OR (95% CI)	**p-value**
Symptom duration (h)	1.076 (1.032-1.121)	**0.001**
Torsion degree (°)	1.004 (1.001-1.007)	**0.019**
WBC count (×10³/μL)	1.132 (0.508-2.523)	0.762
Neutrophil count (×10³/μL)	0.891 (0.319-2.490)	0.825
Monocyte count (×10³/μL)	0.134 (0.001-21.529)	0.438
NLR (%)	2.370 (0.554-10.131)	0.245
PLR (%)	1.005 (0.981-1.031)	0.665
MLR (%)	0.324 (0.000-3517.793)	0.812
SII (×10³/μL)	0.996 (0.989-1.003)	0.254
SIRI (×10³/μL)	0.293 (0.025-3.467)	0.330
AISI (×10⁶/μL²)	1.008 (0.999-1.017)	0.088

OR: Estimated relative risk shown by odds ratio, CI: Confidence interval, WBC: White blood cell, NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, MLR: Monocyte-to-lymphocyte ratio, SII: Systemic immune-inflammation index, SIRI: Systemic inflammation response index, AISI: Aggregate index of systemic inflammation

ROC analysis was conducted to determine the cut-off values for symptom duration, degree of torsion, NLR, PLR, MLR, SII, SIRI, and AISI score for successful testicular salvage in testicular torsion. The evaluation by ROC analysis revealed that symptom duration, degree of torsion, NLR, PLR, MLR, SII, SIRI, and AISI score had diagnostic value in predicting successful testicular salvage (Figures 1 and 2). The threshold for symptom duration was established at 9 hours, while the maximum torsion-degree tolerated was set at 270° (Table 3). Furthermore, 2.21×10³/μL for SIRI and 635.59×10⁶/μL² for AISI were determined as the limit values predicting organ loss. Other hematological parameters for which limit values were determined are given in the table (Table 4).

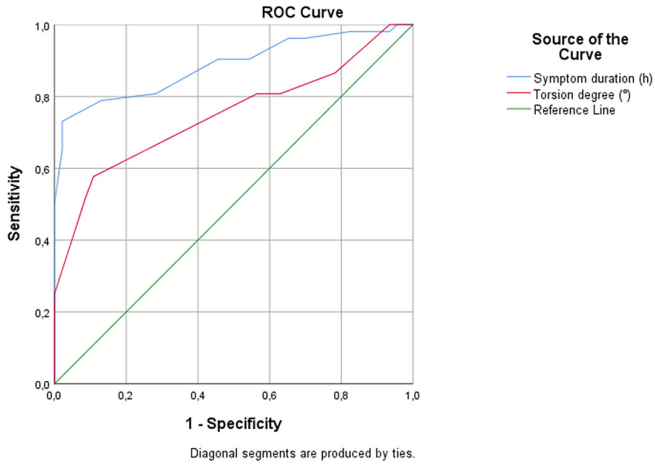

Figure 1. The ROC curve analysis of symptom duration and torsion degree in testicular salvage

ROC: Receiver operator characteristic

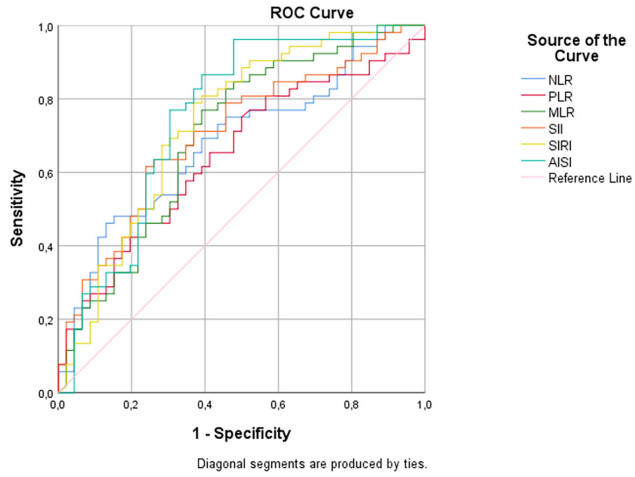

Figure 2. The ROC curve analysis of NLR, PLR, MLR, SII, SIRI and AISI in testicular salvage

ROC: Receiver operator characteristic, NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, MLR: Monocyte-to-lymphocyte ratio, SII: Systemic immune-inflammation index, SIRI: Systemic inflammation response index, AISI: Aggregate index of systemic inflammation

Table 3. Areas under the ROC curve (AUC), sensitivity and specificity by the optimized cut-off points for symptom duration and torsion degree in testicular loss

Risk factor	AUC (95%)	Cut-off	p	Sensitivity (%)	Specificity (%)
Symptom duration (h)	0.885 (0.818-0.953)	9	<0.001	78.8	87.0
Torsion degree (°)	0.749 (0.651-0.846)	270	<0.001	57.7	89.1

ROC: Receiver operator characteristic, AUC: Areas under the ROC

Table 4. Areas under the ROC curve (AUC), sensitivity and specificity by the optimized cut-off points for SII, SIRI and AISI in testicular loss

Risk factor	AUC (95%)	Cut-off	p	Sensitivity (%)	Specificity (%)
NLR	0.679 (0.573-0.785)	3.10	0.002	63.5	63
PLR	0.647 (0.538-0.756)	126.33	0.012	61.5	60.9
MLR	0.700 (0.595-0.806)	0.30	0.001	65.4	65.2
SII	0.704 (0.601-0.807)	968.17	0.001	65.4	65.2
SIRI	0.734 (0.632-0.835)	2.21	<0.001	69.2	69.6
AISI	0.752 (0.651-0.853)	635.59	<0.001	69.2	69.6

ROC: Receiver operator characteristic, AUC: Areas under the ROC, NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, MLR: Monocyte-to-lymphocyte ratio, SII: Systemic immune-inflammation index, SIRI: Systemic inflammation response index, AISI: Aggregate index of systemic inflammation

Discussion

In our study, the mean admission time was 5.5 hours in the successful group and 16 hours in the unsuccessful group. Again in our study, the rate of atrophy after orchidopexy was 22.4%. As a result of the ROC analysis performed to determine the cut-off values for testicular salvage, we showed that this limit was 9 hours for symptom duration and 270° for the degree of torsion.

Testicular torsion is a urological emergency that can result in testicular ischemia and organ loss if not promptly diagnosed and treated. In our study, we examined patients who underwent surgical exploration for testicular torsion and subsequently underwent either orchidopexy or orchiectomy. These patients were also enrolled in the 6-month follow-up schedule. Thus, we evaluated whether atrophy developed in patients treated with orchidopexy. Our study holds significance in assessing the long-term outcomes of orchidopexy and evaluating systemic inflammation indices that have not been previously investigated in the literature.

A study evaluating the duration of symptoms and the degree of torsion reported that the only significant variable in multivariate regression analysis was the duration of torsion (16). However,

this study reported a mean duration of hospital stay of 24 hours for the orchidopexy group and 96 hours for the orchiectomy group. These durations were significantly longer than those observed in our study and in many other studies in the literature (8,18). These increased admission times may have affected the results of the study.

In a study examining the prognostic factors for testicular salvage during testicular torsion, the median duration of admittance to the hospital in the successful testicular salvage group (orchidopexy) was found to be 5 hours, and the degree of torsion was 360°, with a mean follow-up period of 8 months. In the unsuccessful group (orchiectomy + atrophy), these values were reported to be 12.5 hours and 540°. The rate of atrophy after orchidopexy was 25.7%. Howe et al. (8) revealed that the most important prognostic factors for testicular salvage were symptom duration and degree of torsion. In the ROC analysis, the cut-off value for symptom duration was identified as 8.5 hours. These results show similarities to our study. We think that it is significant to have similar results in these two studies with similar admission times, degree of torsion and age range.

In their study, Lian et al. (19) showed that 54% of patients who underwent orchidopexy for testicular torsion experienced testicular atrophy. It was also noted that no testicle with a symptom duration longer than 3 days could be salvaged. The median follow-up period in their study was 12.5 months.

In the study by He et al. (13), the participants were divided into two groups: those who underwent orchiectomy and orchidopexy at their first visits. They showed that symptom duration, degree of torsion, and MPV value were significant predictors of orchiectomy. In the study, 20 out of 54 patients returned for follow-up visits after orchidopexy. Although the volume of the affected testicles was reported to decrease in comparison to the contralateral testicle, they suggested that testicular function was preserved due to blood supply in the testicular parenchyma. However, numerous studies have indicated that the function of the affected testicle decreases after torsion, and this deterioration worsens with prolonged torsion duration (20,21).

There is a limited number of studies investigating the value of hematological parameters in testicular torsion (13,14,22). Yucel and Ozlem Ilbey (9) analyzed patients with acute scrotal pain, including 85 patients who underwent orchiectomy or orchidopexy for testicular torsion, 72 patients diagnosed with epididymitis, and 78 healthy men as a control group. According to the findings of their study, NLR and PLR values were observed to be similar between the torsion and epididymo-orchitis groups, but significantly higher than the control group.

Bitkin et al. (11) evaluated three groups: the epididymo-orchitis, torsion, and control groups, and NLR values were higher in the other two groups compared to the control group. PLR value was higher in the epididymo-orchitis group than in the other groups. NLR was shown to be similar between the torsion and epididymo-orchitis groups.

However, it's worth noting that the age groups of the populations in these two studies were statistically different. There are studies showing that neutrophil count is the lowest in the pediatric period and increases with age, whereas lymphocyte count is the highest in the pediatric period and decreases with age (23). Hence, studies incorporating CBC and systemic inflammatory indices with varying age groups could be restrictive. In our study, we included a patient population with comparable age groups.

CDUS has been safely used for many years with high sensitivity in the differentiation of epididymo-orchitis and torsion. Furthermore, it has been reported that erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) values can also help in the differentiation of these two pathologies (24). Since hematological parameters are not as precise as scrotal CDUS for the differential diagnosis of testicular torsion and are non-specific, like CRP and ESR, it might be more useful to assess whether these parameters can serve as predictive factors in evaluating surgical success.

Under physiological conditions, an increase in platelet count typically results in a decrease in MPV to maintain hemostasis. Since this non-linear inverse relationship between PLT and MPV values can be disrupted in various pathologies, it is recommended to analyze these two values together. MPV is strongly influenced by many inflammatory diseases, age, gender, dietary habits, and genetic factors (25). He et al. (13) reported that the MPV value was predictive of the need for orchiectomy, while Cicek et al. (22) found that the MPV value was significantly different in the testicular torsion group compared to the healthy group. Güneş et al. (14), on the other hand, found significant differences in NLR, PLT, and PLR values between the testicular torsion group and the control group. However, MPV did not play a role in predicting the diagnosis of testicular torsion. Merder et al. (18) similarly noted that the MPV value did not differ between the groups. In our study, we also found that the MPV value did not show a significant difference between the groups. We believe that more data and research are needed to evaluate the use of MPV, which is influenced by factors such as age, gender, eating habits, and genetics, in testicular torsion.

In our study, WBC, neutrophil, monocyte, NLR, PLR, MLR, SII, SIRI, and AISI values were found to be statistically significant and higher in the unsuccessful testicular salvage group compared to the successful group. In a retrospective study of 60 male patients diagnosed with testicular torsion published in 2018, NLR value was reported to be predictive of testicular salvage.

However, since there was no long-term follow-up in that study, the rate of testicular atrophy was not reported. Therefore, testicular salvage is limited to orchidopexies performed in the first stage (26). In our study, more precise results were obtained by assessing long-term testicular atrophy and incorporating systemic inflammatory indices from recent research.

It should be noted that successful testicular salvage offers psychological benefits in addition to physical ones. Research has shown that testicular loss can cause feelings of shame and unease in some men (27). This increases the importance of early admission and intervention in testicular torsion patients.

Study Limitations

There are some limitations to our study. One of these is that scrotal CDUS was not performed by the same radiologist when evaluating the degree of testicular torsion. Another limitation of our study is its lack of generalizability to the broader population due to its single-center, retrospective design. We believe that this study will pave the way for future multicenter prospective studies, providing a more comprehensive representation of the general population. The strengths of our study are the clear distinction between successful and unsuccessful testicular salvage groups through long-term follow-up data analysis, the analysis of previously unexplored parameters SII, SIRI, and AISI, and the establishment of robust cut-off values for critical factors like symptom duration and degree of torsion.

Conclusion

Our study revealed that the most crucial parameters in predicting organ loss in testicular torsion, which can lead to both psychological and physical damage, are the degree of torsion and symptom duration. This underscores the significance of early diagnosis and treatment. This study, which highlights the value and importance of previously unexplored hematological parameters, will contribute to the literature. We think that hematological parameters and systemic inflammatory indices, which can be easily assessed at the time of initial visit, in patients with testicular torsion, may serve as predictors of scrotal exploration outcomes, potentially leading to orchiectomy or the development of testicular atrophy. It is thought that preoperative evaluation of these parameters by the physician and the provision of information about the potential outcomes of orchiectomy or testicular atrophy to the patients and their relatives will facilitate a smoother and more manageable postoperative process.

Ethics

Ethics Committee Approval: This study was approved by the Afyonkarahisar Health Sciences University Clinical Research Ethics Committee (2011-KAEK-2, 2024/2, date: 19.04.2024).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: O.G., M.Ş., K.T., Concept: O.G., M.Ş., K.U., Design: M.Ş., K.T., V.M.Y., Data Collection or Processing: K.U., K.T., Analysis and Interpretation: O.G., K.U., V.M.Y., Literature Search: M.Ş., K.T., V.M.Y., Writing: O.G., K.U., V.M.Y.

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

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

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