

Research Article

Predictor Factors Influencing the Final Outcome and Treatment of Pediatric Patients with Acute Scrotum - Study For a Period of 10 Years

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Abstract: **Introduction:** Acute scrotum is one of the critical emergencies of pediatric urology. Acute scrotum includes various diseases, among which the most prominent are testicular torsion, Morgagni hydatid torsion and epididymitis / epididymorchitis. The outcome of treatment largely depends on the timely recognition of the disease in question, in order to ensure adequate treatment and a positive outcome per patient. Recognition and verification of these prognostic factors is a challenge in a clinical settings, given the intriguing anatomy of the scrotum and the considerable amount of anamnestic data, clinical signs, diagnostic procedures and laboratory findings. **Materials and methods:** The research is designed as a retrospective cohort study with the features of observational, quantitative / analytical and applied study. 297 discharge letters were processed from the Clinic for Pediatric Surgery KCUS in the period from 2009-2019. Subjects were divided into 3 cohorts and 6 categories based on treatment outcomes and treatment options. Variables collected from discharge letters contain data obtained from: history inquiries, clinical examination, diagnostic procedures, and laboratory findings. **Results:** Of the 297 subjects, 89 were treated conservatively and 208 surgically. Out of 208 surgical subjects, 153 of them are in the category without testicular torsion, and 55 in the category with testicular torsion. Orchidectomy was performed on 29 subjects. Statistically significant results were calculated for 38 variables out of a total of 78 calculations, across 5 groups of potential prognostic factors. Age and Duration of symptoms for subjects with testicular torsion, Verified torsion of intrascrotal adnexa and Pathological changes of epididymis for the category of subjects without testicular torsion, Abnormal testicular position and Pathological changes of testicles for the group with testicular torsion, Changes in vascularization and testicular parenchyma in surgical/torsion group of subjects, testicular avascularity in subjects with orchidectomy, and elevated CRP in subjects with testicular torsion/orchidectomy. **Conclusion:** The research work has produced numerous statistically significant results that point out the differences between different cohorts and categories of respondents. Diagnostic methods (US and CD) stand out as a coherent and uniform source of prognostic indicators. Clinical signs are a source of crucial information in certain categories, primarily regarding testicular torsion (through the TWIST scoring system). Acute scrotum is still an emergency, where in case of suspected testicular torsion or some other reason for testicular loss, surgical treatment should not be delayed.

Keywords: Acute scrotum, Testicular torsion, Intra-scrotal adnexal torsion, Epididymitis, Epididymorchitis, Prognostic factors, Cohort Lack of Testicular torsion/Testicular torsion, Orchidectomy.

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INTRODUCTION

Acute scrotum is one of the critical emergencies of pediatric urology. Acute scrotum includes various diseases, among which the most prominent are testicular torsion, Morgagni hydatid torsion and epididymitis / epididymorchitis. The outcome of treatment largely depends on the timely recognition of the disease in question, in order to ensure adequate treatment and a positive outcome per patient. Recognition and verification of these prognostic factors is a challenge in a clinical settings, given the intriguing

anatomy of the scrotum and the considerable amount of anamnestic data, clinical signs, diagnostic procedures and laboratory findings.

Acute scrotum is an urgent medical condition of pediatric urology. Acute scrotum was described as "acute scrotal pain, swelling and / or redness with an indispensable character / feature of an emergency medical condition". However, acute scrotum is a condition that encompasses a range of diseases, from epididymitis to testicular torsion. Studies and research

mainly deal with specific diseases that manifest as acute scrotum. Therefore, data on the overall incidence of acute scrotum in different population groups are incoherent. There are very few data on the incidence of acute scrotum within different pediatric age groups. It is estimated that 0.5% to 2.5% of all emergency room visits are related to the male genitourinary tract. The low specificity for acute scrotum in the above data can be attributed to both the broad etiology and the wide manifestation of the disease. The comparison of the acute scrotum with the acute abdomen is evident, due to the wide range of symptoms and clinical signs and their overlap and similar principles of treatment [1-4]. The scrotum is the outer protective sac that surrounds the testicles. It also has the role of temperature regulation with the aim of facilitating optimal spermatogenesis. The scrotum consists of the left and right halves that are intrascrotal separated by the septum. The position of the septum on external examination corresponds to the position of the Raphe scroti. The scrotal wall consists (from superficial to profuse): skin, superficial fascia, tunica dartos, external spermatic fascia, cremasteric fascia, and internal spermatic fascia. Inside the scrotum are the testicles, epididymis, and spermatic cord. All three structures have anatomical features and variations that are significant for the development and treatment of Scrotum accutum.

MATERIAL AND METHODS

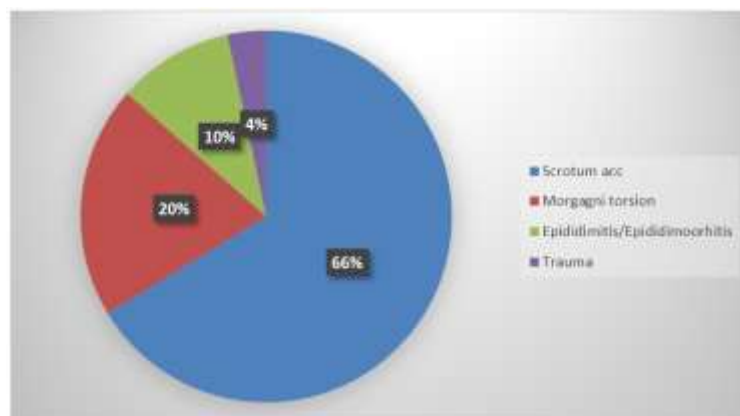
All selected patients were guided under the diagnosis of Scrotum accutum, and this is the main criterion for inclusion of patients in the study. This diagnosis included patients with Torsio testis, Torsio appendix testis, orchitis and / or epididymitis. Following the approval of the Institute for Scientific Research, 297 discharge letters from pediatric patients

treated at the Clinic for Pediatric Surgery KCUS were retrospectively processed. All data were reviewed and collected once, electronically. Discharge documents include patients treated over a ten-year period (2009 to 2019).

Scientific research work is written on the principle of retrospective cohort study. Retrospectively based on the collected data (time period from 2009-2019) and cohort with regard to the classification of patients obtained by electronic examination of discharge documents of the Clinic with Pediatric Surgery KCUS. The cohort division of patients is primarily based on the type of treatment, with an additional categorical division based on the characteristics of the disease and the treatment of the patients (Chart-1). The study has the characteristics of observational, quantitative / analytical and applied study. Observational, because there is no influence and decision-making for exposure to a certain factor, but strict data collection in the current state (electronic review of discharge documents). Quantitative / analytical, with regard to the applied statistical methods for the purpose of presenting and processing data. The study contains the features of an applied study, in order to purposefully analyze the predictor factors related to Scrotum accutum, and that the results and discussion of the study be additional sources of information for the treatment of this disease.

THE RESULTS

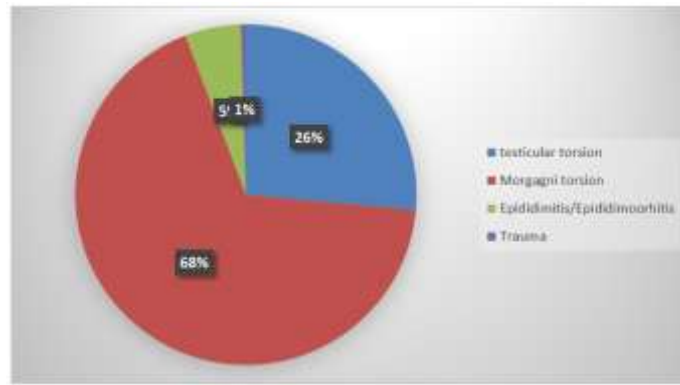
From 89 patients treated conservatively: 59 Scrotum acc. (66.00%), 18 Hydatida Morgagni torsion (20.00%), 9 orchitis and epididimoorchitis (10.00%), 3 Trauma (4.00%) (Graph-1).



Graph-1: Conservatively treated patients

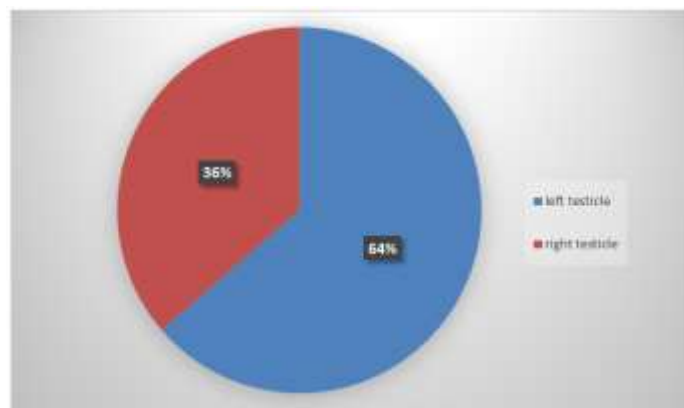
Of the 208 surgically treated patients: 55 testicular torsion (26.00%), 141 Morgagni torsion

(68.00%), 11 orchitis and epididimoorchitis (5.00%), 1 Trauma (1.00%) (Graph-2).



Graph-2: Surgically treated patients

Of the 55 patients with testicular torsion, in 35 cases the left testis was affected (64.00%) and in 20 cases the right testis (36.00%) (Graph-3).



Graph-3: Testicular torsion

Anamnestic data

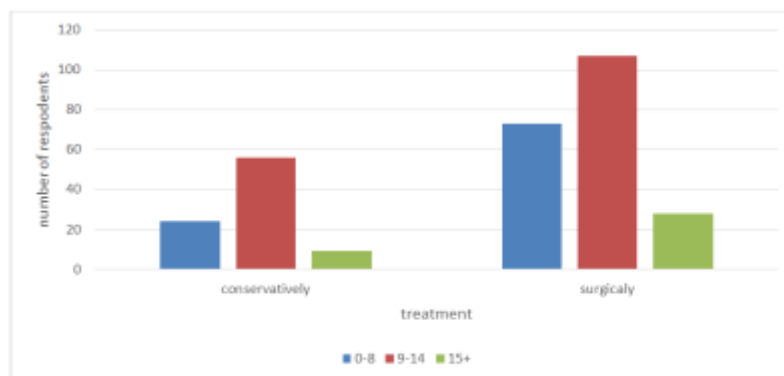
Table-1: Distribution by age of respondents

Group /age	Conservative	Surgically	Total
0-8	24(24.74%)	73(75.25%)	97
9-14	56(34.36%)	107(65.64%)	163
15+	9(24.32%)	28(75.68%)	37
Ukupno	89(29.96%)	208(70.04%)	297

$X^2=3,3191$ $p=0.190255$

There is no statistically significant difference between the groups of patients treated conservatively or

surgically in relation to the age of the patients ($X^2 = 3.3191$ $p = 0.190255$) Graph-4.



Graph-4: Distribution by age of respondents

Table-2: Prepubertal age and testicular torsion.

	No torsion	Testicular torsion	Total
Prepubertal age	109(82.58%)	23(17.42%)	132
Other age groups	44(57.89%)	32(42.11%)	76
In total	153	55	208

p < 0.05 (x² = 15.105), Fisher exact test shows one-sided and two-sided significance (1-sided = 0.000; 2-sided = 0.000)

In the category of patients without testicular torsion, out of 153 subjects, 109 subjects were in the age group 9-14 years (71.24%). In the category of patients with testicular torsion, out of 55 subjects, 23 were in the age group 9-14 years (41.82%). There is a

statistically significant difference in prepubertal age (9-14 years) between patients without testicular torsion and patients with testicular torsion (p < 0.05 (p < 0.001), p = 0.000).

Table-3: Prepubertal age and orchidectomy

	Without Orchidectomy	Orchidectomy	Total
Prepubertal age	11(47.83%)	12(52.17%)	23
Other age groups	15(46.88%)	17(53.12%)	32
In total	26	29	55

p > 0.05 (x² = 0.005)

In the category of patients without orchidectomy, out of 26 subjects, 11 subjects were in the age group 9-14 years (42.31%). In the group of patients with orchidectomy, out of 29 subjects, 12

subjects were in the age group of 9-14 years. There is no statistically significant difference between patients with orchidectomy and those without orchidectomy in prepubertal age (p > 0.05, p = 0.944)

Table-4: Neonatal / Infant age and testicular TORSION

	No torsion	Testicular torsion	Total
< 1 year	3(37.50%)	5(62.50%)	8
> 1 year	150(75.00%)	50(25.00%)	200
Ukupno	153	55	208

p < 0.05 (x² = 5.5615)

In the category of patients without testicular torsion, out of 153 subjects, 3 subjects were younger than one year (2.00%). In the category of patients with testicular torsion, out of 55 subjects, 5 subjects were younger than one year (9.10%).

Inferential statistical analysis showed that there was a statistically significant difference in neonatal / infant age between patients with testicular torsion and patients without testicular torsion. (p < 0.05, p = 0.0317)

Table-5: Neonatal / Infant age and orchidectomy

	Without Orchidectomy	Orchidectomy	Total
< 1 year	1(20.00%)	4(80.00%)	5
> 1 year	25(50.00%)	25(50.00%)	50
Total	26	29	55

p > 0.05 (x² = 1.6412)

In the category of patients with testicular torsion, out of 55 subjects, 5 subjects were younger than one year (9.10%). Out of that, 1 patient is in the category "Without Orchidectomy" and 4 patients are in the category "Orchidectomy". Differential statistical

analysis of the data showed that there was no statistically significant difference in neonatal / infant age between patients with orchidectomy and those without orchidectomy (p > 0.05, p = 0.200).

Table-6: Duration of symptoms

Category (number of respondents)	Raspon(Min-Max)	Mean	Median	p value
Conservatively(89)	10(0-10)	2.53	2.00	p > 0.05 (p = 0.337)
Surgically(208)	30(0-30)	2.65	2.00	
No torsion (153)	30(0-30)	3.06	2.00	p < 0.05 (p = 0.000)
Testical torsion(55)	14(0-14)	1.55	1.00	

There was no statistically significant difference in the duration of symptoms between surgically and conservatively treated patients ($p > 0.05$, $p = 0.337$).

There is a statistically significant difference in the duration of symptoms between patients without testicular torsion and patients with testicular torsion. ($p < 0.05$ / $p < 0.0001$).

Table-7: Duration of symptoms in orchidectomy

	Without Orchidectomy	Orchidectomy	Total
<6 hours	19 (86.36%)	3 (13.64%)	22
>6 hours	7 (21.21%)	26 (78.79%)	33
Ukupno	26	29	55

$p < 0.05$ ($p = 0.000$)

There is a statistically significant difference in the duration of symptoms between patients without

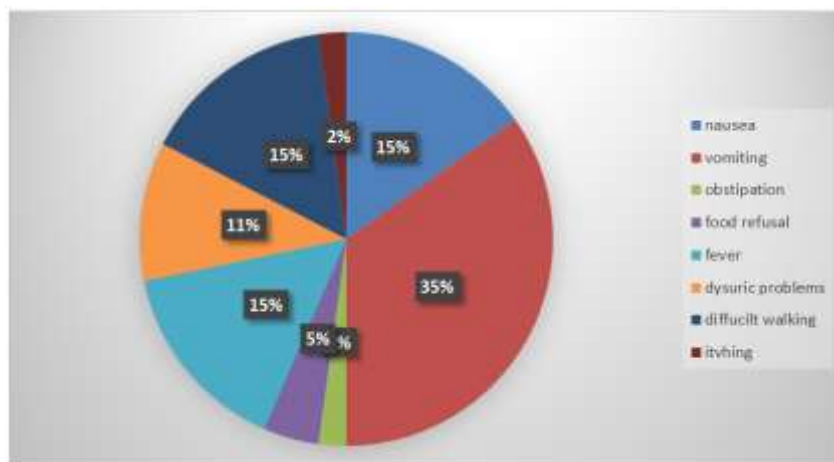
orchidectomy and patients with orchidectomy. ($p < 0.05$ / $p < 0.0001$)

Table-8: General symptoms

General symptoms	Total
Nausea	7
Vomiting	16
Absence of stool	1
Food refusal	2
Fever	7
Dysuric problems	5
Difficulty walking	7
Itching	1

Out of a total of 297 respondents, only 46 showed general symptoms. 16 subjects (5.39%) had vomiting, 7 subjects (2.46%) had nausea, fever and difficulty walking, 5 (1.68%) subjects had dysuric problems, 2 (0.67%) subjects refused food and 1

0.34%) the subject had no stools and no itching. Given the low frequency of these descriptive data, it is not appropriate to perform a more detailed statistical analysis of the data related to general symptoms.



Graph-5: General symptoms

Conservatively treated patients / Operatively treated patients

Table-9: Clinical signs

	Conservative	Surgical	Total	p value
Pain present / number of subjects	89/89	208/208	297/297	
Proximal testicular pain	30(22.06%)	106(77.94%)	136	<0.05
Inguinal pain	1(5.88%)	16(94.12%)	17	<0.05
Abdominal pains	2(15.38%)	11(84.62%)	13	>0.05
Leg pain	2	0	2	/
Scrotal hyperemia	31(16.58%)	156(83.42%)	187	<0.05
Scrotal edema	24(13.64%)	152(86.36%)	176	<0.05
Abnormal testicular position	3(10.34%)	26(89.66%)	29	<0.05
Pathological changes of the testes	17(37.78%)	37(82.22%)	45	>0.05
Pathological changes of the epididymis	10(50.00%)	10(50.00%)	20	<0.05
Pain and other funicular changes	2(25.00%)	6(75.00%)	8	>0.05
Cremasteric reflex	0	2	2	/
Hydrocele present	7(6.86%)	95(93.14%)	102	<0.05
Palpable intrascrotal formation	7(35.00%)	13(65.00%)	20	>0.05
Prehn's sign	2(50.00%)	2(50.00%)	4	>0.05

Predictor factors “Proximal testicular pain”, “Inguinal pain”, “Scrotum hyperemia”, “Scrotum edema”, “Abnormal testicular position”, “Pathological

changes of the epididymis” and “Present hydrocele” show statistically significant differences between conservatively and surgically treated patients.

Table-10: Diagnostic methods

	Conservative	Surgical	Total	p value
Ultrasound and Color Doppler / number of patients	88/89	191/208	279/297	
Testicular hypovascularity	1(4.00%)	24(96.00%)	25	<0.05
Testicular hypervascularity	4(44.44%)	5(55.56%)	9	>0.05
Testicular avascularity	0	34(100%)	34	<0.05
Hypoechoogenicity of the testis	1(6.25%)	15(93.75%)	16	<0.05
Testicular heteroechogenicity	0	21(100%)	21	<0.05
Other pathological changes of the testis	17(26.98%)	46(73.12%)	63	>0.05
Pathological changes of the epididymis	45(38.14%)	73(61.86%)	118	<0.05
Verified testicular adnexa torsion	36(24.00%)	114(76.00%)	150	<0.05
Verified presence of hydrocele	21(16.03%)	110(83.97%)	131	<0.05

Predictor factors exhibit statistically significant differences between conservatively and surgically treated patients.

Surgically treated patients without testicular torsion / Surgically treated patients with testicular torsion.

In the group of clinical signs; “Inguinal pain”, “Scrotal hyperemia”, “Scrotal edema”,

Table-11: Clinical signs

Pain / number of patients present	153/153	55/55	208/208	
Proximal pain	103(97.17%)	3(2.83%)	106	p<0,05
Inguinal pain	9(56.25%)	7(43.75%)	16	p>0.05
Abdominal pains	2(18.18%)	9(81.82%)	11	p<0.05(p<0.0001)
Leg pain	0	0	0	/
Scrotal hyperemia	120(76.92%)	36(23.08%)	156	p>0.05(p=0.056)
Scrotal edema	113(74.34%)	39(25.66%)	152	p>0.05
Abnormal testicular position	0	26(100%)	26	p<0.00001
Pathological changes of the testes	15(40.54%)	22(59.46%)	37	p<0.00001
Pathological changes of the epididymis	7(70.00%)	3(30.00%)	10	p>0.05
Pain and other funicular changes	3(50.00%)	3(50.00%)	6	p>0.05
Cremasteric reflex	0	2(100%)	2	/
Hydrocele present	69(72.63%)	26(27.37%)	95	p>0.05
Palpable intrascrotal formation	13(100%)	0	13	p>0.05 (p=0.056)
Prehn's sign	1(50.00%)	1(50.00%)	2	p>0.05

Predictor factors; “Proximal pain”, “Abdominal pain”, “Abnormal testicular position” (Mann Whitney U test) and “Pathological testicular

changes” show statistically significant differences between patients without testicular torsion and patients with testicular torsion.

Table-12: Diagnostic methods

	No testicular torsion	Esticular torsion	Total	p value
Diagnostic methods: UZ and Color Doppler / number of subjects	138/153	53/55	191/208	
Testicular hypovascularity	6(25.00%)	18(75.00%)	24	p<0.00001
Testicular hypervascularity	5(100%)	0	5	p>0.05
Testicular avascularity	1(2.94%)	33(97.06%)	34	p<0.00001
Hypoechoogenicity of the testis	1(6.57%)	14(93.33%)	15	p<0.00001
Testicular heterogeneity	0	21(100%)	21	p<0.00001
Other pathological changes of the testis	27(58.70%)	19(41.30%)	46	p<0.05
Pathological changes of the epididymis	66(90.41%)	7(9.59%)	73	p<0.00001
Verified testicular adnexa torsion	113(99.12%)	1(0.88%)	114	p<0.0001
Hydrocele present	83(75.45%)	27(24.55%)	110	p>0.05

Predictor factors; “Testicular hypovascularity”, “Testicular avascularity”, “Testicular hypoechoicity”, “Testicular heteroechogenicity”, “Epididymal pathological changes” and “Verified testicular adnexa

torsion” show statistically significant differences between patients without testicular torsion and patients with testicular torsion.

Table-13: Laboratory analysis

	No testicular torsion	Testicular torsion	Total	P value
Laboratory / number of respondents	109/153	49/55	158/208	
Leukocytosis	23(46.00%)	27(54.00%)	50	p<0.05
Elevated CRP	12(30.00%)	28(70.00%)	40	p<0.00001
Urine analysis / number of subjects	11/153	2/55	13/208	

In the group of laboratory analyzes; “Leukocytosis” and “Elevated CRP” show statistically significant differences between patients without testicular torsion and patients with testicular torsion.

Surgically treated patients without orchidectomy / Surgically treated patients with orchidectomy

Table-14: Diagnostic procedures

	No orchidectomy	Orchidectomy	total	p value
Diagnostic procedures / total number of subjects	24/26	29/29	53/55	
Testicular hypovascularity	17(94.44%)	1(5.56%)	18	p<0.00001
Testicular hypervascularity	0	0	0	/
Testicular avascularity	5(15.15%)	28(84.85%)	33	p<0.00001
Hypoechoogenicity of the testis	12(85.71%)	2(14.29%)	14	p<0.05
Testicular heteroechogenicity	1(4.76%)	20(95.24%)	21	p<0.00001
Other pathological changes of the testis	8(42.11%)	11(57.89%)	19	p>0.05
Pathological changes of the epididymis	4(57.14%)	3(42.86%)	7	p>0.05
Verified torsional adnexa torsion	0	1(100%)	1	/
Presence of hydrocele	16(59.26%)	11(40.74%)	27	p>0.05

Predictor factors “Testicular hypovascularity”, “Testicular avascularity”, “Testicular hypoechoogenicity”, “Testicular heteroechogenicity”

show statistically significant differences between patients without orchidectomy and patients with orchidectomy.

Table-15: Laboratory analysis

	No orchidectomy	Orchidectomy	Total	p value
Laboratory / total number of respondents	24/26	25/29	49/55	
Leukocytosis	14(51.85%)	13(48.15%)	27	p>0.05
Elevated CRP	6(21.43%)	22(78.57%)	28	p<0.00001
Urine analysis / total number of subjects	0/26	2/29	2/55	

The predictor factor “Elevated CRP” shows a statistically significant difference between patients with

orchidectomy and patients without orchidectomy.

Table-16: Length of hospitalization

	Range(Min-Max)	Median	Mean	p value
Conservative	19(1-20)	4.00	5.56	p<0.05(0.0001)
Surgical	20(2-20)	6.00	6.62	
No Torsion	16(2-18)	6.00	6.56	p>0.05
Torsion	19(3-22)	6.00	6.76	
Without Orchidectomy	19(3-22)	6.00	7.19	p>0.05
Orchidectomy	9(3-12)	5.00	6.17	

There is a statistically significant difference in the duration of hospitalization between surgically and conservatively treated patients (p <0.05 / p <0.00001).

Table-17: Orchidectomy and torsion side

	No orchidectomy	Orhidektomija	Total
Left testicle	16(45.71%)	19(54.29%)	35
Right testicle	10(50.00%)	10(50.00%)	20
In total	26	29	55

$$\chi^2=0.0938, p=0.759, p>0.05$$

There is no statistically significant difference between patients with left or right testicular torsion compared to orchidectomy.

ultrasound and CD, have acquired the gold standard characteristic in recent years. Laboratory findings provide relevant data, and their contribution should not be neglected.

DISCUSSION

Acute scrotum is an urgent medical condition, requiring conservative or surgical treatment. It is characterized by acute pain, redness and enlargement, and includes various diseases in its etiology. Testicular torsion is the most important diagnostic modality, while torsion of intrascrotal adnexa with epididymitis / epididymoorchitis occupy a secondary position in the order of urgency of timely diagnosis. Predictor factors influencing a positive outcome and the appropriate type of treatment are one of the key research topics in the field of acute scrotum.

This study included 297 patients. Subjects of this study were divided into 6 categories based on outcome and treatment. Out of 6 categories, 3 cohorts were created for statistical analysis of data. By Category 2 treatment, Conservatively and Operatively treated patients, forming a cohort of Conservatively / Operatively treated patients. According to the outcome of 4 categories: No testicular torsion, testicular torsion, no orchidectomy, orchidectomy. 2 cohorts were created in these categories: No Testicular Torsion / Testicular Torsion, No Orchidectomy / Orchidectomy.

Predictor factors were selected and divided based on personal medical knowledge and relevant medical research papers / medical literature. Anamnestic data are the first that a medical professional comes into contact with, followed by an extensive clinical examination in order to endow the relevant clinical signs. Diagnostic imaging procedures,

Inferential statistical analysis showed that there was no significant difference between surgically and conservatively treated patients when it comes to the age of the subjects. 3 age groups were established: 0-8, 9-14, 15+ years, based on the study of Cost *et al.*, [5] Age group 9-14 years, was presented as prepubertal and was used in the study of the cohort "No Testicular Torsion / Testicular Torsion" and "Without Orchidectomy / Orchidectomy". Prepubertal age, as a predictor factor, is also associated with the category of respondents "Without Testicular Torsion" and "Testicular Torsion" (Table 2). However, no significant difference was obtained in the “No Orchidectomy / Orchidectomy” cohort (Table-3). Although the study by Goetz *et al.*, associates the prepubertal age group with a higher incidence of orchidectomy than the postpubertal one [6]. Observing the frequencies of prepubertal age and testicular torsion, in both categories it is represented in a high percentage in relation to the total number of respondents in each category. Prepubertal age is reported as one of the two peaks in the incidence of testicular torsion [7], but in this study it shows a two-way direction of impact. The second peak of testicular torsion is neonatal / infant age, and the predictor role of this variable in testicular torsion was confirmed in this study. In relation to orchidectomy, a 6-hour model of testicular survival was taken, and the relevant influence of symptom duration and testicular survival was shown. The study by Nadwnani *et al.*, shows that the risk of orchidectomy is significantly associated with the duration of symptoms and that in groups with a duration of symptoms over 6 hours, the testicular survival rate is

lower. The study by Mellick *et al.*, indicates that testicular survival is significant after a 6-8 hour period [8, 9]. The study did not take into account the so-called "Door-to-detorsion time", the period from admission to treatment. Gold *et al.* analyzed this factor and concluded that every 10 minutes of treatment delay in clinical conditions increases the risk of testicular loss by 4.8%. (10) When comparing the age and duration of symptoms in relation to testicular torsion and orchidectomy, studies more often cite the duration of symptoms as a more significant predictor factor. Our results show a similar interpretation although age is still important as a predictor factor [11-14]. General symptoms are one of the least investigated groups of predictor factors in this study, primarily due to the low frequency of occurrence within all categories of subjects. Vomiting has the highest frequency (5.39%), followed by nausea, fever and difficulty walking (2.46%).

With the formulation of the TWIST scoring system in 2013, a study by Barbosa *et al.*, Nausea / vomiting play a significant predictor role in evaluating potential cases of operative patients with testicular torsion [15].

In this study, this correlation was not found due to the lack of an adequate number of subjects with nausea / vomiting in any category. However, nausea and vomiting contain clinical value, specific to testicular torsion [16, 17].

Difficulty walking is a general symptom that occurred in extremely swollen scrotums, and did not show a difference in frequency between the categories of subjects. Fever indicates inflammatory processes and is associated with patients with epididymitis / epididymoarrhythmia. In the category of conservative patients EP / EPO are present in 10.00% of cases, and in the category of surgical patients in 5.00% of cases. In conservative patients, fever was noted 1 time and in surgical patients 6 times, showing that there is an association between fever and EP / EPO, but it is not significant to fully support this statement [14]. Abdominal pain has a high significant result in our study. Pogorelic *et al.*, state 25.30% of the frequency of inguinal pain in the group of patients with testicular torsion, with the mention of abdominal pain as a relevant predictor factor which may be the only manifestation in the case of testicular torsion [12]. Abnormal testicular position and pathological testicular changes are one of the most important fields of interest in the evaluation of predictor factors. In addition to the cremasteric reflex, nausea / vomiting form the basis of the aforementioned Barbosa *et al.* a study that defined the TWIST categorization for testicular torsion. Abnormal testicular position is manifested within surgical patients as: 15 high and 17 transversely positioned testicles. Initial study, Barbosa *et al.* (those other studies) cite a highly positioned testis, other

studies also cite a transverse position as indicative of testicular torsion [15-17]. Data analysis found low frequencies for two very specific signs, the Cremasteric Reflex and the Prehn sign. The absent cremasteric reflex is characterized by a high positive predictive value in terms of testicular torsion [18-21].

In our study, it was mentioned only 2 times, in surgical patients and consequently in patients with testicular torsion. With such a low frequency and disabled inferential statistical analysis, it is not possible to check the validity of the absent cremasteric reflex in the area of the acute scrotum.

The same problem applies to Prehn's sign. It has been noted only 4 times, 2 in conservative patients and 2 in surgical patients. Prehn's sign has a predictor value in testicular torsion and epididymitis [22]. However, in this study, the validity of the Prehn mark cannot be fully examined

Studies indicate an association of hypovascular / avascular with testicular torsion. In fact, they are presented as the most significant sign of testicular torsion. This area also includes the mention of vascular changes of the funicular (noted in our study under "Testicular hypervascularity"), presented as a whirlpool sign or pseudomass (funicular-epididymal) which has an even more significant predictor value than the whirlpool sign [23-25].

This study supported the predictor value of hypovascularity / avascularity in the evaluation of acute scrotum and the diagnosis of testicular torsion. Specifically, the association of hypovascularity with orchidectomy and avascularity with orchidectomy is indicated. Vascular phenomena of the spermatic cord, related to testicular torsion, and testicular hypervascularity in some other conditions (inflammatory diseases, TM) are not supported by this study [26].

However, it should be noted the possibility of preserved flow in the case of testicular torsion, and the confusing radiological findings obtained by analysis of these patients. Bandakar *et al.*, report false-negative and false-positive findings in patients with TT or EP / EPO, making timely diagnosis and treatment difficult [24].

The second segment includes parenchymal changes in testicular structure. Testicular hypoechoogenicity is associated with hypovascularity and surgical procedure without orchidectomy. Testicular heteroechoogenicity is associated with avascularity and orchidectomy surgery. Cokkinos *et al.*, study, describes hypoechoogenicity / hypovascularization as "new / current" testicular torsion and thus a higher incidence of rescuing the affected testis. On the other hand, he describes heteroechoogenicity as "past / complete torsion" that has

caused irreparable damage to testicular tissue [27-30]. studies support the role of leukocytosis and elevated CRP as signs of the inflammatory process. Although, inflammatory parameters have no specific prognostic significance for susceptible patients in the acute scrotum domain [31, 32]. The role of prognostic factors in the evaluation of acute scrotum shows certain differences, and absolute certainty in the validity of individual factors is not entirely possible. Anamnestic data, General symptoms, Clinical signs, Diagnostic procedures, laboratory analysis are the most important groups of prognostic factors whose role, use and validity are examined. The most numerous prognostic factors are in the group of clinical signs, although only 12 of them (36.36%) showed p values of statistical significance. On the other hand, diagnostic procedures, presented through 25 factors, have the largest share of statistical significance by number (18/25) and percentage (72.00%). Laboratory analysis also has a high percentage of significant values, but only 6 overall prognostic factors. General symptoms, although often mentioned as influential prognostic factors, did not result in significant results throughout our study. Anamnestic data were presented with 5/14 significant values, 35.71%.

The importance of diagnostic procedures as the leading group of prognostic factors is evident. The TWIST scoring system, introduced by Barbosa *et al.*, [15], enabled the use of clinical signs as the last link in the decision to treat a patient with acute scrotum. Primarily this system refers to testicular torsion. Its role, as a top diagnostic modality, has been shown through certain scientific research papers [33].

Although, diagnostic imaging procedures, ultrasound and CD possess 85-100% sensitivity and 75-100% specificity for testicular torsion. Through this role study, the role of ultrasound and CD in the recognition of tortured intrascrotal adnexa (mostly TM) was presented. EP / EPO shows certain characteristics that UZ and CD note, and enable the doctor to make adequate diagnoses. Ultrasound and CD continue to play a leading role in the evaluation of acute scrotum, and their availability in tertiary clinical conditions is essential [34, 35].

The TWIST scoring system has enabled the rapid treatment of patients who appear to be borderline patients. This system provides a justified operational approach, and in cases of impossibility of ultrasound and CD analysis is the best diagnostic direction.

If the physician is in doubt, with no ultrasound and CD performed, and clinical signs suggest testicular torsion, ultrasound and CD should not delay surgical treatment [36].

CONCLUSIONS

- Prognostic factors significant for patients with testicular torsion are: Prepubertal and Neonatal / Infant age, Duration of symptoms, Abdominal age, Abnormal testicular position, Pathological changes of testicles, Vascular and Parenchymal changes of testicular parenchyma (Diagnostic methods), Other pathological .methods), Leukocytosis, Elevated CRP
- Prognostic factors that indicate the outcome of orchidectomy are Testicular avascularity, Testicular heteroechogenicity, Elevated CRP. diagnostic methods UZ and CD, take a leading role in the prognosis of outcomes.
- The TWIST scoring system showed a statistical impact in 3 of the 5 factors listed in our study. Nausea // Vomiting and Absent creamy reflex due to lack of data are not shown as relevant factors.
- Diagnostic methods (US and CD) have a higher prognostic value than clinical signs.
- The validity of laboratory findings in the evaluation of acute scrotum is present, but not crucial for timely diagnoses, correct treatment and a positive outcome.

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