Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Paediatric Neurosurgery

Role of C - reactive protein for Assessment for Exploration of Acute Scrotum in Children: A Study was done in a Tertiary Care Hospital

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DOI: 10.36347/sjams.2022.v10i12.016 | **Received:** 22.10.2022 | **Accepted:** 29.11.2022 | **Published:** 05.12.2022

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Abstract **Original Research Article**

Background: Acute scrotum comprises a long list of differential diagnosis. The patient suffering from an acute scrotal condition requires urgent medical care. It must be evaluated promptly and accurately to make a management plan especially to save the testis from necrosis in torsion. Decision making regarding the plan for exploration is more important than reaching an exact diagnosis. ***Objectives:*** To differentiate emergency surgical acute scrotal conditions from non-surgical cases. To establish an early diagnosis of acute scrotum in children. To avoid negative exploration of acute scrotum in many cases. ***Methods:*** Sixty four patients of different age groups ranging from neonate to 12 years were underwent surgical exploration under general anesthesia (GA) between January 2016 to December 2019. The study was conducted in the Faculty of Paediatric Surgery in Bangladesh Shishu Hospital & Institute (BSH&I). A total of 72 patients were admitted with acute scrotal pain and/or swelling and evaluated by taking detailed history of presenting complaints, careful physical examinations, different laboratory investigations including serum c-reactive protein (CRP) level and radiology & imaging studies whenever appropriate and available. ***Results:*** Out of 72 cases admitted for acute scrotum, serum C - reactive protein (CRP) level estimation was done in all cases and surgical exploration was done in 64 cases. Total sample size was 64. In age incidence majority of patients were >1 year-6 years (37.5%) and >6 years-12 years (34.37%). Majority of patients came with scrotal swelling (100%), pain (93.77%) and fever (65.62%). Majority of patients came after 48 hours of onset of symptoms and exploration was performed within 6 hours to 12 hours. Blood collection was done >48 hours since complaints in majority cases (59.38%). Serum CRP level was negative in majority cases of Torsion testis (TT) and Torsion appendix testis (TAT). Total count of WBC was raised in majority of inflammatory cases like Epididymo-orchitis (EDO), Epididymitis (ED) and scrotal abscess (SA). In majority cases, (n=40) Torsion testis or appendicular torsion was found. The validity of test for CRP was accurate in 90.63% and P-value was <0.001.*** ***Conclusion:*** Estimation of serum CRP level in patients with acute scrotum assist in differentiating inflammatory and non-inflammatory causes. Serum CRP level can be used selectively as an accurate, rapid and less expensive diagnostic tool for acute scrotum for exploration and it could be possible to reduce negative exploration of acute scrotum to some extend.

Keywords: Acute scrotum, Serum CRP level, surgical exploration.

INTRODUCTION

Acute scrotum is defined as an acute painful swelling of the scrotum or its contents accompanied by local signs and general symptoms [1]. Acute scrotum includes a long list of differential diagnosis. Acute testicular torsion, torsion of appendages acute epidiymo-orchitis account for 35%, 42% and 10% of acute scrotum respectively [2]. However, Cass reported 65% of all acute scrotal pain to be due to testicular torsion [3]; Hemalata & Rcikwood found 22% torsion testis, 55% torsion of appendages and 10% due to epididymo-orchitis [4]. The patient suffering from acute scrotal condition requires urgent medical care. It must

be evaluated accurately and promptly to make a management plan especially to save the testis from testicular necrosis in torsion. Early diagnosis may be possible in the disease process by careful clinical examination correlated with necessary investigations available at hand [5]. Decision making regarding the plan for exploration is more important than reaching an exact diagnosis.

The incidence of torsion testis approximately 1/4000 [6]. It is most common in peripubertal boys and during the perinatal period but can occur at any age [6]. Testicular torsion must be considered in any patient who complains of acute scrotal pain and swelling. Torsion of testis is a surgical emergency because the likelihood of testicular salvage decreases as the duration of torsion increases. Condition that may mimic testicular torson, such as torsion of a testicular appendage, epididymitis, orchitis, trauma, hernia, hydrocele, varicocele and Henoch-Schonlein Purpura, generally do not require immediate surgical intervention [7]. The diagnosis of acute scrotum can usually be established based on a careful history, a through physical examination and appropriate diagnostic tests [7]. The onset, character and severity of symptoms must be determined. The physical examination should include inspection and palpation of testis, epididymis, scrotum and inguinal region. Urinalysis should always be performed, but scrotal imaging is necessary only when the diagnosis remains unclear [7].

In a study, patients with acute epididymitis showed at least a 4-fold elevation of C-reactive protein (CRP). Patient with a testicular torsion or testicular tumor had no significant elevation and those with inflammatory conditions was statistically significant (P<0.001) [8]. CRP rises within 6 hours of any inflammatory stimulus [9]. Parents and physicians should remain alert and respect acute scrotal conditions keeping in mind the possible catastrophic consequences of any delay. Even in experienced hands dilemma remains and urgent exploration is mandatory in all cases. A study regarding patterns and management of acute scrotum in children [5] is focused on reaching a diagnosis. It would be possible to avoid negative exploration in many cases correlating the clinical features and other supportive investigations along with a simple, easily available and less expensive test serum CRP level estimation.

MATERIALS AND METHODS

This prospective study was done on male children from neonate to 12 years admitted with provisional diagnosis of acute scrotum. The study was conducted in the Faculty of Paediatric Surgery, Bangladesh Shishu Hospital and Institute (BSH&I) from January 2016 to December 2019. Inclusion criteria were all male patients within the age range of neonate to 12 years who were provisionally diagnosed as acute scrotum. Careful history taking, clinical examination and data collection was done. A total of 72 patients were admitted with acute scrotal pain and /or swelling and were evaluated. Available laboratory diagnostic tools like Total count (TC) of white blood cell (WBC), serum CRP level, urine for routine microscopic examination (R/M/E) & culture sensitivity (C/S) and radiology & imaging studies were done whenever appropriate and available. Sixty four (64) patients were underwent surgical exploration whose parents gave inform written consent for surgery under general anesthesia.

RESULTS

Out of 72 cases admitted for acute scrotum, serum C-reactive protein (CRP) estimation was done in all cases and surgical exploration was done in 64 cases. Total sample size was 64. In age incidence majority of patients was in >1 year-6years (37.5%) and >6 years-12 years (34.37%) (Table-I).

Table-I: Age incidence of the study population (n=64)

Age Group	No. of patients	Percentage (%)
<1 month	4	6.25
>1month-1years	14	21.87
>1 year-6 years	24	37.5
>6 years-12 years	22	34.38

Majority of patients came with scrotal swelling pain and fever (Table-II & Figure-1).

Table-II: Clinical presentations of the patients (n=64)

Symptoms	No. of patients	Percentage (%)
Scrotal swelling	64	100
Pain	60	93.75
Fever	42	65.62
Nausea/vomiting	20	31.25
Dysuria/Urethral discharge	4	6.25
H/O Trauma	4	6.25
Inguino-scrotal swelling (Reducible)	4	6.25

Fig:-1: **Acute right hemiscrotum showing swollen and reddish colour**

Fig:-2: **Acute left hemiscrotum showing high-up position of testis in torsion**

Serum CRP level was negative in majority of cases of Torsion testis (TT) and Torsion appendix testis (TAT) and serum CRP level was positive in all cases of inflammatory condition (Table-III).

Table-III: Serum CRP level estimation

Clinical condition	No. of Patient (n=64)	CRP level +Ve	CRP level –ve
Torsion testis	26	6	20
TAT/TAE	14	0	14
EDO/ED	12	12	0
SA	8	8	0
Obs. Ing.Hernia	4	0	4

Total count of WBC was raised in majority of inflammatory cases (Epididymo-orchitis and scrotal abscess) (Table- IV, Figure-3 & 4).

Table- IV: Total count of WBC

Clinical condition		Number of patients	Normal count (4000-11000/ cumm)	Increased Level (>11000/cumm)
Inflammatory	EDO/ED	12	2	10
Group	SA	8	0	8
Non-	TT/TAT/TAE	40	18	22
Inflammatory group	Obs. Ing.hernia	4	2	2

Fig:-3: **Inflammatory condition of left hemiscrotum of (Scrotal abscess)**

Fig:-4: Inflammatory condition of left hemiscrotum (Acute Epididymo-orchitis)

Urine for R/M/E and C/S was done in all 64 cases. Findings are shown in (Table-V).

Table-V: Urine R/M/E & C/S finings

Clinical condition	No. of Patients(N)	Normal findings + No growth	Abnormal findings + growth
EDO/ED	12	6	6
SA	8	8	0
TT/TAT/TAE	40	40	0
Obs.Ing. Hernia	4	4	0

In all the 64 cases TC of WBC, Urine for E/M/E & C/S and serum CRP level estimation were done. So fever in clinical presentation and cremasteric reflex in physical findings alone with above three parameters were taken for statistical analysis. Validity of tests is shown in table VI. The validity of CRP was accurate in 90.63% and P-value was <0.001*** (Table-VI).

Table-VI: Validity of Test

Parameter	Sensitivity	Specificity	Positive Predictive value	Negative Predictive Value	Accuracy	Chi-square (x^2) (P value)
Fever	90.00	45.45	42.86	90.91	59.38	<0.05*
Cremasteric reflex	70.00	70.27	58.33	85.00	75.00	<0.01**
TC of WBC	90.00	45.45	42.86	90.31	59.38	<0.05*
CRP Level	100.00	86.36	76.92	100.00	90.63	<0.001***
Urine R/M/E	30.00	100.00	100.00	75.86	78.13	<1.01**

During the study period several conditions were presented as acute scrotum. According to the study protocol all the patients was explored surgically. In per-operative diagnosis Torsion testis (TT) was in the top of the list (n=26) followed by torsion appendix testis (TAT) (n=14) and scrotal abscess (n=8). Other two conditions presented less frequently (Table- VII).

Table – VII: Per operative findings

Operative Diagnosis	No. of Patients (n=64)	Percentage (%)
Torsion of testis (TT)	26	40.63
Torsion appendix testis (TAT)	14	21.87
Scrotal abscess(SA)	8	12.5
Epididymo-orchitis (EDO)	6	9.38
Epididymitis (ED)	6	9.38
Obs. Inguinal hernia	4	6.25

Fig-5: **Showing Torsion testis (left) with gangrenous change**

Fig-6: **Showing Torsion appendix testis (left) with gangrene**

Fig-7: **Showing red and swollen testis and Epididymis (left) in Epididymo-orchitis**

DISCUSSION

This prospective study was carried out from January 2016 to December 2019 in the Faculty of paediatric surgery in Bangladesh Shishu Hospital and Institute (BSH&I). A total number of male patients with the provisional diagnosis of acute scrotum admitted were 72. Sixty four patients were surgically explored and included in the study (n=64).

Age range of the patients was neonate to 12 years. One third of the patients were from >1 to 6 years (37.5%), one third were from 6-12 years (34.37%) and rest were below 1 year. Two pick incidences were observed in a study. Most common is in peri-pubertal boys and during the peri-natal period, but can occur at any age [6]. In this study out of 26 patients of torsion testis, 2 patients were neonate, 6 patients were below 1 year and 18 were between 1 to 12 years. This result justifies that torsion testis can occur at any age. Testicular torsion has leveled as more common in neonates and early adolescent [3]. Common occurrence of torsion testis in between 1 to12 years were found in this study which is similar to study [3]. Epididymo-orchitis and epididymitis were much more common under the age of 6 years that comprises 83.33% in the current study. In this study, number of different diagnosis was present. Torsion testis is the commonest (40.63%) followed by torsion appendages (21.87%), Epididymo-orchitis and epididymitis (18.76%). In the current study most of the patients 36(65.25%) presented late (>48 hours) after the onset of symptoms. This study mostly co-incides with the study done by Rahman [5]. Swelling (100%) and pain (93.75%) in the affected hemiscrotum were the commonest presenting symptoms. Fever (65.62%), loss of sleep (46.88%) and nausea/vomiting (31.25%) were the other symptoms. Dysuria/urethral discharge were present in only 4 patients (6.25%). This also coincides with the study done by Rahman [5]. In physical findings, enlarged or swollen testis or hemiscrotum was the commonest (100%). Pain or tenderness was present in 93.75% patients followed by fever in 65.62%. All the patients with testicular torsion, pain erythema or edema and swelling of the ipsi-lateral hemiscrotum were present except one who presented with torsion of left undescended testis. Hutson quoted a high incidence of up to 20% for torsion in undescended testis [9].

This study was performed to find out that how much investigation could support of making decision for surgical exploration of acute scrotum and which investigation is much more sensitive and specific. Total count of WBC, serum CRP level and Urine R/M/E were done in all cases before emergency exploration. Urinary findings were normal in all the cases of torsion, obstructed inguinal hernia and scrotal abscess. This result co-inside with the study done by Paul *et al.*, [12].

Regarding serum CRP level estimation, in 26 cases of torsion testis CRP was negative in 20 cases (76.92%) and positive in 6 cases (23.07%). In 14 cases of appendicular torsion, CRP was negative in all cases (100%) & in all 4 cases of obstructed inguinal hernia CRP level was negative. In all the 20 cases of Epididymo-orchitis and epididymitis CRP level was positive in 100%. Patient with epididymitis showed at least a 4 fold elevation of CRP ($p<0.001$) [10]. In this study, regarding serum CRP level estimation sensitivity of CRP value was 100% and specificity was 86.36%, positive predictive value 76.92%, negative predictive value 100% and accuracy was 90.63% ($p<0.001$). This CRP level is highly significant test among the other parameters (Table-VII). Out of 64 study cases, conventional gray scale USG was possible to be done only in 18 cases and torsion testis was found positive by USG findings in only 6 cases out of 8 torsion testes (75%). The sensitivity of colour Doppler study for detection of acute torsion in children is between 92 to 100% [11]. No colour Doppler study could be done in

the present study due to time constraints and unavailability.

Surgical exploration was performed in all the cases depending on the clinical basis and provisional diagnosis as torsion testis and procedures were done according to per-operative findings. There were total 26 cases of torsion testis in the present study, 24 were on the left side (92.31%) and two on the right side (7.69%) and there was no bilateral torsion. Hemalata & rickwood found torsion 53% on the left side and 47% on the right side [3]. Which a bit differ with the present study. Torsion of appendages was found in 14 cases (21.87%) out of them torsion appendix testis (TAT) was found in 10 cases. Rahman found appendicular torsion in 7.14% [5] which also differ from this study.

CONCLUSION

Determination of serum CRP level in patient with an acute scrotum assists in the differential diagnosis of inflammatory from non-inflammatory conditions which is a major issue for emergency surgical exploration for saving testis from necrosis in torsion. Serum CRP level can be used selectively as an accurate, rapid and less expensive diagnostic tool for acute scrotum and it could be possible to reduce negative exploration of acute scrotum to some extend.

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