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Original Article

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To study the outcomes of scrotal exploration for acute scrotal pain in relation to monthly and daily temperature variations: A large contemporary series from a Teaching Hospital

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ABSTRACT

BACKGROUND & OBJECTIVE: Acute testicular pain requires emergency exploration for suspected testicular torsion (TT). It has been suggested that temperature variation is associated with TT. However, it was not possible to conclude whether the higher occurrence of TT was related to TT itself or the effect of the overall higher presentation of acute scrotum. We studied the impact of seasonal and daily temperature variations on acute testicular pain and outcomes.

METHODOLOGY: Acute testicular pain requires emergency exploration for suspected testicular torsion (TT). It has been suggested that temperature variation is associated with TT. However, it was not possible to conclude whether the higher occurrence of TT was related to TT itself or the effect of the overall higher presentation of acute scrotum. We studied the impact of seasonal and daily temperature variations on acute testicular pain and outcomes.

RESULTS: In total, 502 patients required testicular exploration. The median age and duration of symptoms were 16.4 yrs. (1.3 – 77) and 4 hrs. (1 – 336). Respectively, TT was found in 231 (46%), torsion of the testicular appendix (TTA) in 126 (25%), epididymal inflammation (EI) in 46 (9.2%), and no identifiable cause (NIC) was found in 99 (19.7%). Scrotal explorations were more common in groups with mean daily temperature >6.20C, 60.2% Vs 39.8% while there was no difference in TT 46% Vs 46% in these groups.

CONCLUSION: There was no seasonal variation for testicular torsion or operative findings. Cold weather and average low daily temperatures were not related to testicular torsion.

KEYWORDS: Torsion of testis, Orchiectomy, Temperature.

INTRODUCTION

Acute scrotal pain is a urological emergency and requires an urgent scrotal exploration to rule out testicular torsion (TT). The incidence of TT is 2 – 4 per 100,000 with the highest incidence (10.46 per 100,000) between 10 – 19 years [1,2].

However, a recent study from Ireland's public hospitals showed a very high rate of TT 21.76 per 100,00 possibly due to the availability of a general database and accessibility of population-based services in those hospitals [1]. TT usually occurs without any precipitating cause. The ischemic damage and testicular salvage are dependent on the duration of symptoms (time between onset of pain and de-torsio and degree of twisting of the spermatic cord (SC) [3-5].

However, a recent study from Ireland's public hospitals showed a very high rate of TT 21.76 per 100,00 possibly due to the availability of a general database and accessibility of population-based services in those hospitals [1]. TT usually occurs without any precipitating cause. The ischemic damage and testicular salvage are dependent on the duration of symptoms (time between onset of pain and de-torsion) and degree of twisting of the spermatic cord (SC) [3-5].

The studies were done to ascertain the seasonal relationship of TT and showed variable outcomes the majority had a small sample size [6-9]. Researchers also tried to find an association of TT with atmospheric temperatures and suggested a relationship with low atmospheric temperature exists [10-13].

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In all these studies, only diagnosed cases of TT were included and it was not possible to assess whether the higher occurrence of TT was related to TT itself or due to the overall higher presentation of cases with acute scrotal pain requiring acute scrotal exploration. We studied the impact of seasonal and daily temperature variations on acute scrotal presentations and outcomes of scrotal explorations.

METHODOLOGY

Data was collected retrospectively from case notes and electronic records on a cohort of patients from January 2006 to December 2017 who required urgent scrotal exploration for suspected TT at Bradford Teaching Hospitals NHS Trust. We collected information on demographics, clinical history, duration of symptoms, intra-operative findings, and the need for orchidectomy. Average monthly and average daily temperatures (0C) were recorded for all patients' presentation dates. Daily and monthly temperature data for the Bradford region were taken from https://en.tutiempo.net/climate/united-kingdom.html.

For seasonal analysis, patients were categorized into four groups: Winter (December – February), Spring (March-May), Summer (June – August) and Autumn (September – November). The UK's coldest months are February and January, followed by December and November. Mean monthly temperatures during these colder months ranged from 3.40C to 6.20C. Therefore, colder months were defined if the mean monthly temperature was ≤6.20C for the specific month, while warmer month was defined if the mean monthly temperature was >6.20C [Table 1]. Patients were also divided into two groups according to the average daily temperature (Tm) on the day of presentation (≤6.20C Vs >6.20C).

Statistical analysis was done using IBM SPSS Statistics Software version 22 (IBM Corporation, Armonk, New York, USA), and statistical significance was considered at p <0.05. The Kruskal-Wallis test was used to assess group differences between continuous variables age, and duration of symptoms as data was not normally distributed on the Shapiro-Wilk test, The chi-square test was used to analyze the relationship between categorical variables.

RESULTS

During the study period of 12 years, 502 patients required acute scrotal explorations for suspected TT. The median age at presentation and duration of symptoms was 16.4 years (1.3 – 77) and 4 hours (1 – 336) respectively. Right-sided explorations were performed in 237 Patients (47.2%), while 265 patients (52.8%) underwent left-sided exploration. Operative findings showed TT in 231 (46%), torsion of testicular appendix (TTA) in 126 (25%), epididymal inflammation (EI) in 46 (9.2%), and no identifiable cause (NIC) in 99 (19.7%). Median ages for TT, TTA, EI, and NIC were 16, 11, 21, and 12.5 years, respectively. There was a significant difference observed in age with the final diagnosis (P <0.0001). In the TT group, orchidectomy for non-viable testis was required in 34 (14.7%), while 197 (85.3%) testes were salvaged. [Table-II].

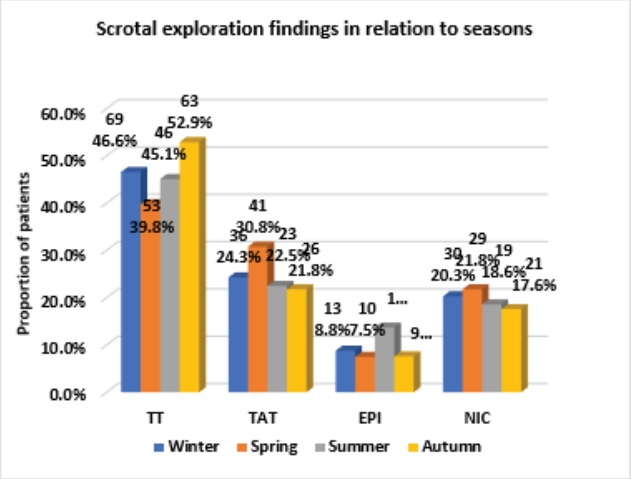

Fig-I | Scrotal exploration findings in relation to seasons. (Chi-square p 0.473)

There was no significant difference in TT during different seasons (winter, spring, summer, and autumn). Also, TTA, EIP, and NIC were not significantly different for different seasons p =0.473 There were 148 (29.48%), 133 (26.50%), 102 (20.31%), and 134 (26.7%) scrotal explorations performed in winter, spring, summer and autumn, respectively [Fig-I].

A higher number of scrotal explorations 284 (56.57%), were performed during warmer months in comparison to colder months 218 (43.43%). In colder and warmer months operative findings of TT and other outcomes were not significantly different p=0.903.[Fig-II].

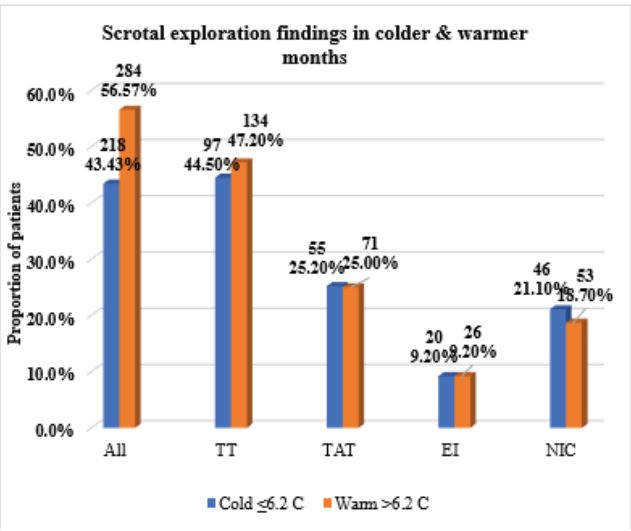

Fig-II: Scrotal exploration findings in colder and warmer months. (Chi-Square p=0.903)

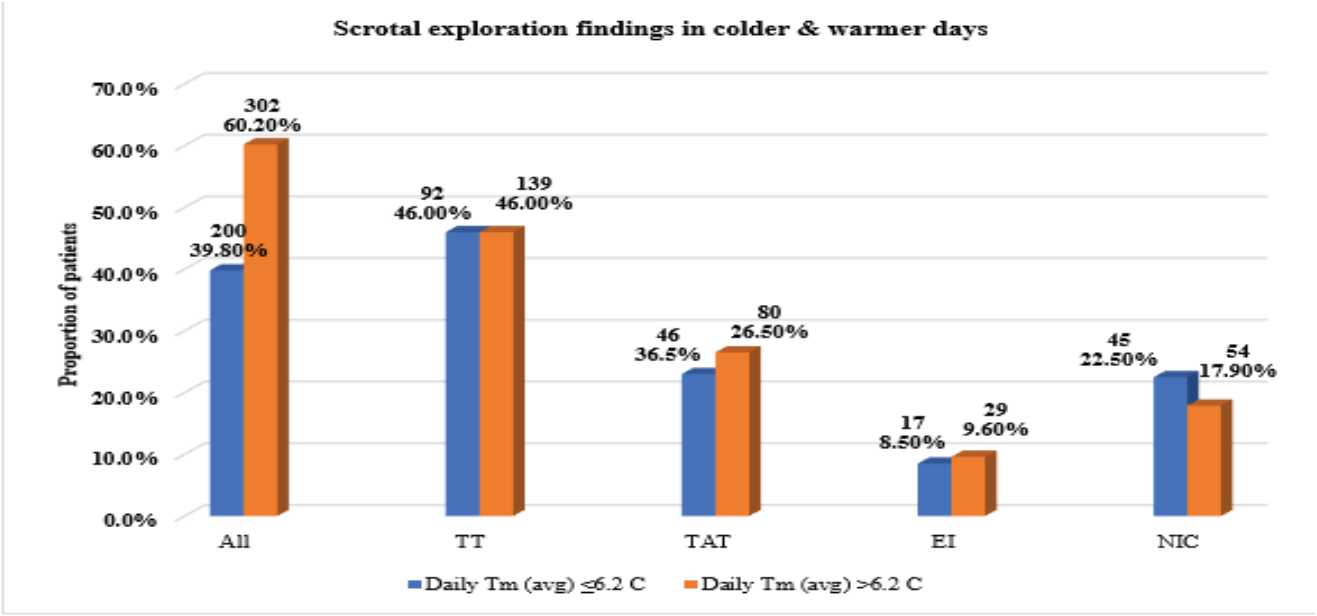

Fig-III: Scrotal exploration findings in colder and warmer days. (Chi-Square p= 0.563)

There were 200 (39.8%) scrotal explorations performed when average daily temperatures were ≤6.20C, while 302 (60.2%) when mean daily Temperatures were >6.20C. Operative findings during mean daily temperatures of ≤6.20C Vs >6.20C were not significantly different p= 0.563. [Fig-III]

Table-I: Average monthly temperatures in Celsius (Jan 2006 – Dec 2017)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
January	3.4	5.7	5.4	2.8	0.6	2.8	3.9	2.5	4.2	3.3	4.2	3.5
February	3.1	4.6	4.6	3.3	1.2	5.0	3.5	1.9	4.7	3.3	3.4	4.8
March	3.0	5.7	4.5	6.2	5.1	5.5	7.4	0.9	6.0	4.8	4.5	7.1
April	6.7	9.5	6.3	8.8	7.7	10.4	5.6	6.0	8.7	7.7	5.6	7.6
May	10.3	10.1	11.5	10.4	9.5	10.6	12.9	9.3	10.9	9.2	10.5	11.6
June	14.6	13.1	12.9	13.2	14.0	12.9	11.7	12.7	13.8	12.6	13.2	14.2
July	18.0	13.7	14.9	14.6	15.2	13.9	13.9	17.0	16.4	14.0	15.3	14.6
August	14.4	14.2	14.9	15.2	13.6	13.7	14.7	15.5	13.3	14.7	15.1	14.0
September	14.7	12.3	12.4	12.6	12.5	13.4	11.5	11.9	13.2	11.0	14.4	11.9
October	11.2	9.7	8.6	10.0	9.0	10.6	7.6	10.8	10.8	9.5	9.5	11.1
November	7.0	6.6	5.9	6.9	3.9	8.2	5.5	5.2	7.2	7.8	4.4	6.1
December	5.6	4.0	3.0	2.2	-0.4	4.6	3.5	5.5	4.4	7.8	5.9	4.2

Table-II: Summary of results for acute scrotal exploration (Jan 2006 – Dec 2017)

Side of Exploration (%)			
Right	237 (47.2%)		
Left	265 (52.8%)		
Orchidectomy when TT was detected	34 (15%)		
Aetiology	**n(%)**	**Age (years) Median, (min-max), IQR**	**Duration of Symptoms (hrs)*Median, (min-max), IQR**
Torsion	231 (46)	16 ,(3 – 77) , 8.6	4, (1.5 – 336) , 3
Torsion of appendix testis	126 (25)	11,(1.3 – 24) , 4.3	4.2, (1.5 – 96), 3.6
Epididymal inflammation	46 (9.2)	21, (5 – 54), 16	5, (2.5 – 48), 6.4
No cause found	99 (19.7)	12.5, (5 – 56) ,12	4, (1 – 72) , 2
Total Explorations	502(100)	14, (1.3 -77) , 9	4, (1 -336) , 3
		P ≤0.0001	**P≤ 0.001**

* Kruskal Wallis test for independent sample

Table-III: Detailed average monthly temperatures in Celsius (2006 – 2017)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Mean	Minimum	Maximum
January	3.4	5.7	5.4	2.8	0.6	2.8	3.9	2.5	4.2	3.3	4.2	3.5	3.5	0.6	5.7
February	3.1	4.6	4.6	3.3	1.2	5.0	3.5	1.9	4.7	3.3	3.4	4.8	3.6	1.2	5
March	3.0	5.7	4.5	6.2	5.1	5.5	7.4	0.9	6.0	4.8	4.5	7.1	5.1	0.9	7.4
April	6.7	9.5	6.3	8.8	7.7	10.4	5.6	6.0	8.7	7.7	5.6	7.6	7.6	5.6	10.4
May	10.3	10.1	11.5	10.4	9.5	10.6	12.9	9.3	10.9	9.2	10.5	11.6	10.6	9.2	12.9
June	14.6	13.1	12.9	13.2	14.0	12.9	11.7	12.7	13.8	12.6	13.2	14.2	13.2	11.7	14.6
July	18.0	13.7	14.9	14.6	15.2	13.9	13.9	17.0	16.4	14.0	15.3	14.6	15.1	13.7	18
August	14.4	14.2	14.9	15.2	13.6	13.7	14.7	15.5	13.3	14.7	15.1	14.0	14.4	13.3	15.5
September	14.7	12.3	12.4	12.6	12.5	13.4	11.5	11.9	13.2	11.0	14.4	11.9	12.7	11	14.7
October	11.2	9.7	8.6	10.0	9.0	10.6	7.6	10.8	10.8	9.5	9.5	11.1	9.9	7.6	11.2
November	7.0	6.6	5.9	6.9	3.9	8.2	5.5	5.2	7.2	7.8	4.4	6.1	6.2	3.9	8.2
December	5.6	4.0	3.0	2.2	-0.4	4.6	3.5	5.5	4.4	7.8	5.9	4.2	4.2	-0.4	7.8

DISCUSSION

Anderson, in 1988, reported outcomes of acute scrotal exploration in 670 patients, which is one of the largest series from the United Kingdom [6]. We presented regional data on the outcomes of acute scrotal exploration. All the patients with suspected TT were included. In our study, 25% of the population was older than 20 years. TT was the most common diagnosis (46%), followed by TTA (25%). Median age was higher in TT (16 years) compared to TTA (11 years). In our series, the TTA frequency was lower than in other studies (40% - 57%).

This difference could be due to the studies done in paediatric patients only (age <17 years [14-17]. Molokwu found TT and TTA to be 51% and 24%, respectively, while Nasan reported TT and TTA to be 46.5% and 30.3%, respectively, which were comparable to our results [18,19]. Immediate orchidectomy rates for non-viable testes in TT ranged between 10% - 50% [20-22]. In our study, orchidectomy was required in 14.7% of the TT group.

Various studies looked at the seasonal association of TT and reported variable outcomes. Williams studied seasonal preponderance in 135 confirmed cases of testicular torsion in children. The study showed that 30% of cases occurred in autumn, 24% in winter, 22% in summer, and 23% in spring with no significant difference (p 0.52). Daily or monthly temperatures were not provided [14]. Karakan found no seasonal association of TT with seasons in 56 cases (p 0.39) [8].

Lyronis in 140 patients showed that TT and TTA were found in 35 (25%) and 42 (30%), respectively. There was a higher occurrence of TT (74.3% Vs 25.7%) and TTA (64.3% Vs 35.7%) in winter, p <0.036 and p<0.047, respectively [15]. Ekici, in a study of 30 patients, reported a higher occurrence of TT in winter [16]. Most of the above studies had a small number of cases, did not provide details of mean or daily monthly temperatures, and only provided data for TT. A larger cohort study by Molokwu showed seasonal variation with colder months of TT and TTA cases. Altogether there were 23% episodes of TT & TTA, the findings were not specific to TT but included TTA patients [23].

Our study included a large number of cases and provided data for all acute scrotal exploration findings. It showed that the highest number of acute scrotal explorations were performed in warmer months. Also, there was no significant difference in the proportion of operative findings in different seasons.

Studies also showed that TT was more common in colder months when ambient temperatures were low, and it did not follow a seasonal pattern. Shukla showed that 87% of TT cases (n = 46) occurred when the mean daily temperature was <20C. This effect was also seen during colder months [11].

Molokwu found a higher frequency of TT in colder months when mean temperatures were <50C and concluded cold weather predisposes to TT [18]. The study Srinivasan (n = 58) showed no difference in TT frequency in relation to months but showed higher TT frequency when the mean daily temperature was <150C [10]. Driscoll studied 134 children with TT and found no significant variation in colder and warmer months. These results did not support the Molokwu study which was also performed in the same geographic area [24]. We found a higher number of scrotal explorations, 297 (56.57%) performed during warmer months in comparison to colder months 205 (43.43%).

Operative findings were not significantly different in colder and warmer months. We also analyzed the effect of lower daily mean temperatures at the presentation time. These results showed a higher frequency of scrotal exploration (TT and TAT) when mean daily temperatures were >6.20C. We also found that overall operative findings remained the same for colder vs warmer months and daily temperature groups.

Hyperactive cremasteric reflex stimulated by cold has been hypothesized to take part in testicular torsion in cold weather. However, clinically, it was seen that the onset of symptoms occurred when patients were inside the house and room temperatures were well above the atmospheric

temperatures [24]. However, an experimental study by Bingol-Kologlu about cremasteric contractility showed high amplitude contractions when temperature increased from 220C to 370C[25].

Further, people remain well protected from the effects of cold by wearing appropriate clothing. It is also seen that most patients were awakened from sleep before the presentation due to pain [20]. Hence, it is questionable whether cold conditions are solely responsible for a higher frequency of testis torsion.

Our study was limited by retrospective data collection but included a large number of cases (>500), eliminating the statistical bias associated with small study populations. Also, many of the studies analyzed only torsion of the testis in relation to seasons, colder vs. warmer months, and daily average temperatures. Our study provided comparison data for all operative findings for the above-mentioned parameters.

CONCLUSION

Our data showed no seasonal variation in testicular torsion. Cold weather and average low daily temperatures were not related to testis torsion. There was no significant change in the operative findings during different seasons. Also, the operative diagnosis did not differ significantly for monthly and daily temperature variations.

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CONFLICT OF INTEREST: None.

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Authors' Contribution:

Adeel Anwar: Substantial contributions to the conception and design of the work.
Ghulam Mustafa Nandwani : The acquisition and analysis of data for the work.
Sanjai K Addla : Drafting and interpretation of data for the work.
James A Forster: Final approval of the version to be published.