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LEE AS, POHL HG, RUSHTON HG, DAVID TD. Impact of COVID-19 pandemic on the presentation, management and outcome of testicular torsion in the pediatric population - an analysis of a large pediatric center. *Can J Urol* 2021;28(4):10750-10755.

Introduction: To examine the impact of COVID-19 pandemic on the presentation, management and outcome of testicular torsion at our institution.

Materials and methods: A retrospective review of a prospectively maintained testicular torsion database was performed. Patients \leq 18 years of age evaluated in our emergency room between 3/11/2020 to 10/1/2020 (during-COVID-19) and the same period in 2018 and 2019 (pre-COVID-19) with US diagnosed and OR confirmed testicular torsion were included. Basic demographics, timing of presentation, referral rate, time to OR and orchiectomy rate were extracted and compared. P < 0.05 was considered statistically significant.

Results: A total of 82 torsions were included in the study; 55 pre-COVID-19 and 27 during-COVID-19. The incidence of testicular torsion remained the same;

Introduction

Testicular torsion, a twisting of the spermatic cord leading to diminished blood flow to the testis, is one of the most common pediatric urological emergencies with

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Address correspondence to Dr. Tanya D Davis, Division of Urology, Children's National Hospital,111 Michigan Avenue NW, Washington, DC 20010 USA 3.93 cases/month pre-COVID-19 versus 3.86 cases/ month during-COVID-19 (p = 0.791). However, there were significantly fewer delayed (> 24 hours) presentations (11.1% versus 45.5%, p = 0.003), shorter time from onset of symptoms to presentation (median 15.5 hours versus 8 hours, p = 0.001), and a lower but not statistically significant overall orchiectomy rate (33.3% versus 50.9% p = 0.1608) during-COVID-19. Among those presenting acutely with torsion (< 24 hours from onset), no statistical differences were found in the median time from US diagnosis to OR, from ED to OR, referral rate, or orchiectomy rate between the two groups. Lastly, SARS-CoV2 testing did not delay median time from ED to OR.

Conclusions: There was a notably less delayed presentation of testicular torsion and shorter ischemia time on presentation during-COVID, however, no significant change of time to OR or orchiectomy rate in those with acute testicular torsion were observed.

Key Words: COVID-19, testicular torsion, pediatric, orchiectomy

an estimated yearly incidence of 3.8-5.08 per 100,000 among the pediatric male population.¹⁻³ Prolonged ischemia time of the testis leads to permanent damage to the testis with potential decrease in fertility rate and/ or testis loss.⁴ Thus, the timeliness of its diagnosis and surgical detorsion is of paramount importance. Previous studies have shown the rate of orchiectomy correlates with increasing time from symptom onset to surgical detorsion with national and local data demonstrating that 30%-41.9% of boys undergoing surgery for torsion undergo orchiectomy.^{1,4-8}

In early 2020, social distancing, quarantine and stay at home orders were imposed widely across the country to slow the spread of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2) and the spread of the resultant coronavirus disease 2019(COVID-19) pandemic.⁹⁻¹¹ Due to fears of contracting the SARS-CoV2 virus, many patients have been hesitant to seek medical care in a hospital setting with a resultant decrease in non-COVID-19 Emergency Department (ED) visit rates.¹² This trend has also been demonstrated in patients seeking urological emergent care.¹³ These factors combined can lead to a potential delay in both the presentation and care of testicular torsion with a hypothesized increased orchiectomy rate. The objective of this study is to investigate the impact of the COVID-19 pandemic on the presentation, management and orchiectomy rate of testicular torsion in a pediatric hospital.

Materials and methods

Study design and patient population

We performed a retrospective cohort study of all patients who presented to the ED at Children's National Hospital (Washington, DC), a tertiary care pediatric healthcare system with an ultrasound (US) diagnosis and surgically confirmed testicular torsion between March 11 and October 1 of 2018, 2019 and 2020. Patients that presented from March 11, 2020 to October 1, 2020 were included in the during-COVID-19 group and those that presented during the same time frame but in 2018 (March 11, 2018 - October 1, 2018) and 2019 (March 11, 2019 - October 1, 2019) were included in the control, pre-COVID-19 group. March 11, 2020 was selected as the start of our during-COVID-19 group as it was the date that a public health emergency was declared in our area.¹⁴

Patients were identified by searching the Implementation of the Accelerated Care of Torsion (ACT) pathway registry, a prospectively managed quality improvement database of all patients diagnosed with testicular torsion that subsequently underwent surgery at our institution.⁶ Those with neonatal torsion, intermittent torsion and those who were explored but did not have a testicular torsion were excluded from the study. Patients presenting initially to another hospital or a facility other than our ED for evaluation were considered "referred" and those presenting directly to our ER for initial evaluation were considered "direct". Nasopharyngeal or oropharyngeal swab SARS-CoV2 PCR testing was performed on all patients presenting to our ED who were admitted, needed surgical interventions, were symptomatic or with known SARS-CoV2 exposure starting in late April 2020, whether direct or referred, but the result was not required prior to proceeding to the OR for patients with suspected testicular torsion (all patients were treated as Patient Under Investigation's pending result of testing). This study was of the ongoing testicular torsion quality improvement initiative at our institution and therefore was considered exempt by the Children's National Hospital Institutional Review Board.

Outcomes

The primary outcomes of the study were time from symptom onset to presentation (ischemia time) and rate of orchiectomy. As orchiectomy rate increases with time and delayed presentation often results in orchiectomy, timing from symptom onset to presentation in our ED was further sub-classified into acute (< 24 hours) and delayed (> 24 hours). A sub-analysis of the primary outcomes including only those patients presenting with acute torsion was also performed.

Referral rate, time from ED triage to operating room (ED to OR) and time from ultrasound diagnosis to OR (US to OR) were secondary outcomes. The various time frames were extracted from timestamps recorded in the electronic medical record. Patient arrival time in the OR was used to determine ED to OR and US to OR time. Of note, secondary outcomes were not analyzed for delayed presentations as there could be potential elective delay in the timing of their surgical management since testicular salvage was deemed futile. Furthermore, due to the higher likelihood of testicular salvage for those with acute presentation, our institution had previously implemented an ACT pathway in April 2016 which was continued throughout the entirety of this study period. The specific details and impact of the ACT pathway have been previously reported.6

Statistical analysis

Differences in patient characteristics between those presenting pre-COVID-19 and during-COVID-19 were assessed by t-tests, Mann-Whitney U-tests, or chi-square tests as appropriate for the distribution and nature of the data. Chi-square tests were used to compare referral rates and orchiectomy rates. T-tests were used to compare ischemia time, US to OR and ED to OR times. P value of <0.05 was considered statistically significant. Statistical analyses were performed using R (R Core Team, 2020). All tests were two-sided and a p value < 0.05 was the threshold for statistical significance.

	Pre-COVID-19 (March 11, 2018-October 1, 2018 and March 11, 2019-October 1, 2019)	During-COVID-19 (March 11, 2020- October 1, 2020)	p value
Number of patients	55	27	
Median age in years (IQR)	14 (12, 15)	14 (13, 15)	0.6257
Median weight in kg (IQR)	54.1 (44.35, 68.35)	53.3 (44.35, 64.8)	0.4818
Ethnicity			0.1792
Caucasian	8 (14.5%)	1 (3.7%)	
African-American	29 (52.7%)	12 (44.4%)	
Latino	14 (25.5%)	6 (22.2%)	
Other/unknown	4 (7.3%)	8 (29.6%)	

TABLE 1. Demographics of patients presenting with testicular torsion in the pre-COVID-19 and during-COVID-19 time period

TABLE 2. Presenting characteristics of patients presenting with testicular torsion. Those presented < 24 hours from symptom onset where considered acute

	All testicular torsions Pre-COVID-19 During-COVID-19 p value		Acute testicular torsions Pre-COVID-19 During-COVID-19 pvalue			
Number of patients	55	27		30	24	
Referred	30 (54.5%)	12 (44.44%)	0.532	15 (50%)	10 (41.7%)	0.592
Median ischemia time in hours (IQR)	15.5 (6, 48)	8 (4.25, 14)	0.001	6.5 (3, 11.25)	6.75 (3.875, 10.5)	0.826
No. of delayed presentation	25 (45.5%)	3 (11.1%)	0.003			

TABLE 3. Timing from US to OR and ED to OR of those presented with acute testicular torsions. Sub-analysis were performed for those received SARS-CoV2 testing

Number of patients SARS-CoV2 tested	Pre-COVID-19 30	During-COVID-19 24 18	p value
Median ischemia time in hours (IQR)	6.5 (3, 11.25)	6.75 (3.875, 10.5)	0.826
SARS-CoV2 tested		6.5 (4.125, 11.5)	0.641
Median time from ED to OR in mins (IQR)	118 (108, 151)	123 (112, 133)	0.478
SARS-CoV2 tested		123 (114, 130)	0.528
Median time from US to OR in mins (IQR)	102 (76, 121)	100 (75, 109)	0.373
SARS-CoV2 tested		100 (78, 112)	0.263

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Results

A total of 82 patients met inclusion criteria. Fiftyfive patients were pre-COVID-19 and 27 patients were during COVID-19. Median age at the time of diagnosis was 14 (IQR 12, 15) years old pre-COVID-19 and 14 (IQR 13, 15) years old during-COVID-19. Basic demographics were not statistically different between the two groups and are listed in Table 1. The incidence of testicular torsion remained the same; 3.93 case/month pre-COVID-19 versus 3.86 cases/month during-COVID-19 (p = 0.791). When comparing timing of presentation, more patients in the pre-COVID-19 group had delayed presentations than during-COVID-19, 45.5% versus 11.1% respectively (p = 0.003). Similarly, the median ischemia time was longer in the pre-COVID-19 group, 15.5 (IQR 6, 48) hours when compared to the median ischemia time during-COVID-19, 8 (IQR 4.25, 14) hours (p = 0.001). Presenting characteristics are listed in Table 2. The orchiectomy rate as shown in Figure 1 was lower during-COVID-19, 33.3% compared to pre-COVID-19, 50.9%, however the difference was not statistically significant (p = 0.1608).

Thirty patients pre-COVID-19 and 24 patients during-COVID-19 presented acutely with torsion (< 24 hours of ischemia time). The median ischemia time was 6.5 (IQR 3, 11.25) hours pre-COVID-19 and 6.75 (IQR 3.88, 10.5) hours during-COVID-19 (p = 0.826). Fifty percent of those in the pre-COVID-19 group initially presented at another facility (referred) compared to 41.7% during-COVID-19 (p = 0.592). The median time from ED to OR and US to OR were 118 (IQR 108, 151) minutes and 102 (IQR 76, 121) minutes pre-COVID-19, and 123 (IQR 112, 133) minutes and 100 (IQR 75, 109) minutes post-COVID-19 (p = 0.478 and p = 0.373, respectively).





Six patients in the during-COVID-19 group presented prior to our SARS-CoV2 testing mandate and therefore were not tested for SARS-CoV2. In the 18 patients that received SARS-CoV2 testing during-COVID-19, the ED to OR times and US to OR and were 123 (IQR 114, 130) minutes and 100 (IQR 78, 112) minutes which were similar to the pre-COVID-19 group noted above (p = 0.263 and p = 0.528, respectively). Of the 18 that were tested, only one patient tested positive for COVID. Although the orchiectomy rates were higher in the during-COVID-19 groups, 29.2% versus 13.3% pre-COVID-19, the difference was not statistically significant (p = 0.1862), see Table 3.

Discussion

In this study, we found a similar incidence of testicular torsion during-COVID-19 when compared to pre-COVID-19, however there was a statistically significant decrease in time from onset of symptoms to presentation and fewer patients with a delayed presentation of torsion to our institution during-COVID-19. While not achieving statistical significance, the orchiectomy rates were found to be lower for all torsions (acute and delayed presentations) but higher in the setting of an acute presentation during-COVID-19. We believe the lower overall orchiectomy rate is due to the lower proportion of patients presented in a delayed fashion and the resultant decrease in ischemia time during-COVID-19. Our orchiectomy rate findings were similar to those found by Nelson et al, however, we did not find a statistically significant increase in the incidence of testicular torsion during-COVID-19 at our institution.¹⁵ Additionally, we found a notable change in the presentation pattern of testicular torsion during-COVID-19, with fewer delayed presentations compared with pre-COVID-19.

Recent studies have illustrated a decrease in other disease diagnosis as a result of delayed presentation due the impact of the COVID-19 pandemic.¹⁶⁻¹⁸ Some of these delays have resulted in significant consequences, including an increase in mortality rate.¹⁹ Specific to Urology, Porreca et al found statistically less urological emergent cases, including testicular detorsion during COVID-19.¹³ However, contrary to their findings, we found the incidence of testicular torsion at our institution remained the same between pre-COVID-19 and during-COVID-19 at our institution. Perhaps due to the severe discomfort and acute onset of the symptoms of testis torsion, we suspect that this would be more likely to cause a patient and their family to seek emergency care sooner as compared to disease processes with more chronic and insidious symptoms.

Surprisingly, our findings also showed a decrease in time from onset of symptoms to presentation and fewer delayed presentations of testis torsion during-COVID-19. Although our data did not contain information on the reasons for delay of presentation, one potential explanation for this finding could be parents are now spending more time at home and are better able to observe their child as a result of the various public health measures (e.g. working remotely from home). Additionally, without the constraints of a traditionally structured work-day, parents may now potentially have an easier time rearranging their work obligations to bring their children to ED for evaluation. Furthermore, closure or decreased availability of access to primary care physicians can contribute to parents bringing their child to the emergency room directly and thus decreased delayed presentation.

The results of our sub-analysis of patients presenting with acute torsion was reassuring as we did not find a statistically significant difference between the time from ED presentation to the OR when comparing pre-COVID to during-COVID testis torsion cases. Said another way, despite provider perception to the contrary, the need to treat every testis torsion patient as presumptive COVID-19 positive did not significantly impact the time from ED to OR. This finding further supports the robustness of our current ACT clinical pathway and its ability to address changing institutional needs without compromising the care of testis torsion patients.

Finally, while many studies have demonstrated worse surgical outcome in those who were SARS-CoV2 positive, including those who were asymptomatic,²⁰⁻²² during our study time period, only one patient was tested positive for SARS-CoV2. As such, we were not able to perform any analysis on the impact of SARS-Co2 on surgical outcome.

Although we found no negative impact of the COVID-19 pandemic to the presentation, management and outcome of testicular torsion, we acknowledge the limitations to our study. As this is a chart review study, we were limited by what was documented in the electronic record. As such, timing from symptom onset to presentation was an estimation to the best of our ability. Additionally, we were not able to report reasons for delay of presentation as often they were not included in the chart. Our institution is a tertiary academic referral center located in an urban setting, so our data might not be generalizable. Lastly, the true incidences of testicular torsion during-COVID-19 time period could be different as we did not contain data from other surrounding hospitals, however our referral rates from outside institutions did not change for either

delayed or acute presentations. A multi-institutional study is needed to further study the impact of COVID-19 pandemic on pediatric testicular torsion. Despite the above limitations, we believe our findings shed some light on the impact of the COVID-19 pandemic on the presentation, management and outcome of testicular torsion.

Conclusions

COVID-19 pandemic did not negatively impact the presentation, management and outcome of testicular torsion in the pediatric population at our institution. A higher proportion of pediatric patients with testicular torsion presented acutely during-COVID-19 with similar ER to OR time and orchiectomy rate. However, further studies are needed to validate these findings.

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