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Research Article

Seasonal Effects of Testicular Torsion in a Region of Australia

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Abstract

Purpose: Testicular torsion is a time-critical surgical condition with dire consequence for misdiagnosis resulting in loss of the affected testis and ensuing lifelong impact on endocrine, sexual, and psychological outcomes. Since crematic reflex and testis level in scrotum can be affected by the ambient temperature, this study evaluates seasonal variations in testicular torsion and likely salvage rate.

Method: This retrospective study evaluates the incidence of testicular torsion between the period of July 2012 to October 2023 in a single institution in subtropical climate. Basic demographics, time of presentation, surgery, and meteorological data were collected.

Results: A total of 80 participants were identified who underwent scrotal exploration. July has the highest incidences of testicular torsion (n=15, 20%), correlating with the lowest mean temperatures of the year. Winter months accounted for the highest cases (n=28, 35%). A Chi-square test of independence revealed a significant association between seasonal variation and the incidence of testicular torsion ($p<0.05$, $\chi^2(3, N = 80) = 7.8$).

Conclusion: A seasonal association for testicular torsion occurs more frequently in winter months even in a subtropical climate. This study suggests testicular torsion occurrence appears to correlate with the change in temperature rather than temperature itself.

Keywords: Bell-clapper; Orchidectomy; Orchidopexy; Seasonal effects; Testicular Torsion

Abbreviations: EMR: Electronic Medical Record; PAH: Princess Alexandra Hospital

Introduction

Testicular torsion is a time-critical surgical condition caused by the sudden rotation of the spermatic cord and its contents. It is most commonly seen in younger patients during puberty and early 20s and may be predisposed by a congenital abnormality of the processus vaginalis in some cases and family history [1]. The consequence of misdiagnosis or late diagnosis is associated with loss of testis with lifelong impact on endocrine and sexual functions, cosmesis and psychology [1]. Whilst much has been studied regarding the clinical presentation, management, and outcomes of testicular torsion, the potential seasonal variation in its incidence and the seasonal relations to geography remains less explored. Spermatogenesis is sensitive to a raised temperature and similarly, the cremasteric muscle activity is affected by ambient

temperature. As a result, when the ambient temperature falls, the dartos muscle contracts, causing wrinkling of the scrotal skin and change in testicular level. This reduces scrotal surface area to minimise heat loss and allow for optimal thermal regulation for spermatogensis. This mechanism has been thought to account for the increased incidence of torsion seen in cooler climates [2]. This article evaluates the seasonal variations effects of testicular torsion and examines whether there is a correlation between the time of year and the frequency or presentation of testicular torsion even in subtropical climate.

Method

A retrospective observational analysis was conducted at a major quaternary Princess Alexandra Hospital (PAH) in Southeast Queensland, Australia between 1 July 2012 and 31 October 2023. Local ethics approval was obtained through the PAH Human Research Ethics Committee. A database captured patients under the ICD-10 code of 'N44' - 'Torsion of testis' in the hospital admission coding. Patients who did not undergo surgical exploration were excluded. Basic demographics, time of presentation, length of stay, surgery performed were obtained via independent review of the Electronic Medical Record (EMR). Further sub-analysis of the data was conducted to reveal whether there were intra-operatively findings of torsion. Meteorological data from the local weather service was obtained and included the temperature (minimum, maximum and average), wind chill, precipitation, humidity, as well as cloud cover in Brisbane, Queensland where PAH is located. This data correlated with the date of the patients who presented with testicular pain and had undergone an operation.

These results were subsequently analyzed using a chi-square test of independence to assess the statistical significance of the findings. SPSS (IBM 2024) was used to analyse the results.

Results

A total of 80 participants fulfilled the criteria and were evaluated during this 11-year period. The median age of these participants was 27.5 years (18-45), with a mean age of 30 years (+/- 9.8). The average length of hospital stay for these individuals was 1.16 days (+/-0.7). Among the 80 scrotal explorations performed, 67 (84%) cases confirmed the presence of testicular torsion, necessitating either detorsion or orchidectomy. Notably, 27 of these torsion episodes occurred during the winter months, accounting for 40.2% of the total cases of confirmed testicular torsion. Weather data, including average temperature, humidity, and precipitation, were collected and analyzed for each season over the 11-year period. Average temperatures at time of presentation ranged from 16 degrees Celsius in winter to 25 degrees Celsius in summer. Humidity levels exhibited minimal seasonal variation, with averages ranging from 67.5% to 72.7%. The seasonal distribution of presentations revealed that 16 cases occurred in spring (20%), 18 in summer (22.5%), 18 in autumn (22.5%), and 28 in winter (35%). July emerged as the month with the highest incidence of testicular torsion presentations, reporting 15 cases (20%), coinciding with the lowest mean temperatures of the year. Conversely, March and October recorded the fewest presentations, each with 4 cases (5.3%).

Temperature analysis indicated that 12 torsion cases (18%) occurred at temperatures below 15 degrees Celsius, while 28 (42%) occurred at temperatures between 15 and 20 degrees Celsius. Additionally, 18 torsion cases (27%) were recorded at temperatures ranging from 20 to 25 degrees Celsius, and 9 cases (13%) occurred at temperatures exceeding 25 degrees Celsius. A Chi-square test of independence revealed a significant association between seasonal variation and the incidence of testicular torsion, $\chi^2(3, N = 80) = 7.8, p < 0.05$. This finding underscores the potential influence of seasonal factors on the occurrence of this urological emergency.

Discussion

In literature, testicular torsion predominantly affects younger males, with a peak incidence observed between the ages of 12 and 18. However, while the condition is more common in this age range, it can also occur in adults. In our study, the median age of participants was 27.5 years (range: 18-45), with a mean age of 30 years (± 9.8). These findings align with existing literature, which reports a similar mean age of approximately 30 years for testicular torsion in adults [3]. A total of 27 cases of testicular torsion occurred during the winter months, accounting for 40.2% of the total cases of confirmed testicular torsion. July emerged as the month with the highest incidence of testicular torsion presentations, reporting 15 cases (20%). A Chi-square test of independence revealed a significant association between seasonal variation and the incidence of testicular torsion, $\chi^2(3, N = 80) = 7.8, p < 0.05$. This finding underscores the potential influence of seasonal factors on the occurrence of this urological emergency. Testicular torsion is defined by the twisting of the testis around the longitudinal axis of the spermatic cord, which decreases blood flow with ensuing venous congestion, and edema and ischemia of the testis. Testicular torsion is a surgical emergency, and early intervention provides the best chance of testicular survival [4] to prevent irreversible ischaemic injury to underlying testicular function [5]. Literature shows that following loss of a testes, the remaining testis often compensates by increasing testosterone production following an orchidectomy; however, this compensatory mechanism may not fully restore hormone levels, particularly in cases where the remaining testis is affected by underlying issues or if there is a delay in treatment [6]. This hormonal imbalance can lead to symptoms such as reduced libido, fatigue, and potential impacts on mood and bone density [6]. As for the psychological impact, loss of testis can have a negative effect. It is well documented

that a testicular prosthesis can lead to improvements in self evaluation, mood swings, depression, and confidence [7]. Acute scrotal pain accounts for 0.5% of all ED presentations. Out of these presentations, about 15 - 25% of these presentations may have genuine testicular torsion leading to scrotal exploration [8]. Diagnosis is usually established clinically by history and clinical examination. Imaging is usually not necessary and discouraged to reduce the delay to treatment. Certain scoring systems such as TWIST [9] have been created to aid in risk stratification with patients who present with acute scrotal pain. As a result, timely diagnosis and intervention are critical, as delays can result in testicular necrosis and loss.

The risk factors for testicular torsion have previously been established. Anatomical variants such as bell-clapper deformity have been shown to have a higher incidence of acute testicular torsion. This deformity involves a defect where the tunica vaginalis attaches to the testicle, resulting in increased testicular mobility and a higher risk of torsion [10]. In this study, bell-clapper deformity was documented in 13 patients (19%).Trauma to the testicle also increases the risk of torsion. This is believed to occur due to an abrupt vigorous contraction of the cremaster muscle, accounting for a proportion of all cases [11,12]. Cryptorchidism, or undescended testicle, is also another risk factor for testicular torsion. The condition occurs when one or both testicles fail to descend into the scrotum during fetal development or shortly after birth. This malposition increases the risk of torsion because an undescended testicle is typically less anchored within the scrotum and more prone to twisting along the spermatic cord. The absence of normal scrotal fixation allows the testicle to rotate more freely, making it more susceptible to torsion, particularly during periods of physical activity or trauma [13]. Our research suggests that another potential risk factor would be a result of seasonal variation, with increased cases during the winter months. Colder atmospheric temperature is potentially associated with hypercresmateric reflex, which potentially could cause a twisting of the spermatic cord as it pulls the testicles closer to the body. The increase in the cremasteric reflex with cold weather and the rotation of the elevated testicle is considered to be a contributing factor to testicular torsion and the relationship with seasons has been evaluated in international studies [14].

This study is consistent with previous studies published from a variety of areas such as Scotland, Africa, UK to name a few. This is the largest series from Australia where the temperature variation and overall condition is subtropical. With regards to similar climate, previous studies in Brazil have shown that seasonal variations do occur, with a significant increase in incident cases during colder months [4]. Given the similar subtropical weather described in Queensland, Australia, the findings of this study is supported by it. Another study done in the UK with regards to paediatric population shows an increasing incidence of testicular pain and torsion was observed with decreasing atmospheric temperature and humidity [2]. Similarly, a study conducted in Turkey, which experiences a Mediterranean climate, has shown results that are comparable to those observed in Southeast Queensland, a region characterized by a subtropical climate. Despite the differences in climate types, both areas share certain climatic features, such as warm, dry summers and mild winters, particularly along their coastal regions. This study highlights the surprising similarities in outcomes across these geographically distinct areas, suggesting that factors such as temperature patterns, seasonal variations, and possibly local environmental conditions may play a role in producing comparable results, even in climates that are technically different [15].

Understanding the seasonal patterns of testicular torsion has significant implications for clinical practice. Awareness of potential peaks in torsion incidence can guide healthcare providers in educating at-risk populations, particularly adolescents engaged in winter sports, about the signs and symptoms of torsion. Early recognition and intervention are crucial, as timely surgical intervention can prevent irreversible testicular damage. Additionally, this knowledge can inform healthcare systems about resource allocation and preparedness during peak seasons, enhancing patient outcomes. Despite the insights provided by existing studies, several limitations must be acknowledged. Many studies suffer from small sample sizes or limited geographic scope, which may restrict the generalizability of findings. Additionally, variations in methodology and diagnostic criteria across studies complicate the ability to draw definitive conclusions about seasonal patterns. The reliance on retrospective data can introduce biases, and factors such as socioeconomic status and access to healthcare are often not accounted for, which may influence reported incidence rates. Future research should aim to incorporate larger, multicenter studies that account for diverse populations and variables to provide a clearer understanding of the seasonal effects of testicular torsion.

Conclusion

A seasonal association for testicular torsion occurs more frequently in winter months even in a subtropical climate. This study suggests testicular torsion occurrence appears to correlate with the change in temperature rather than temperature itself. While our data underscore the importance of awareness and early intervention in diagnosing testicular torsion, particularly during this season, further research is warranted to explore the underlying mechanisms that may link seasonal variations to the prevalence of testicular torsion, which could lead to improved preventive strategies and patient outcomes. Understanding these associations can enhance clinical practice and patient education, ultimately reducing the incidence

and complications related to this urgent urological condition.

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