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Mini Review

Effect of Seasonality on Occurrence of Testicular Torsion and the Resulting Endocrine and Exocrine Testicular Function

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ABSTRACT

Testicular torsion is characterized by acute onset of testicular pain and swelling, due to twisting of the spermatic cord and its contents. This serious urological condition requires prompt presentation by the patient, followed by prompt diagnosis and urgent surgical exploration within 4-8 hours, to avoid irreversible ischemic damage. The main factors determining testicular salvage are duration since symptom onset and degree of torsion. Whether surgical orchiectomy or orchiopexy was performed to preserve the affected testis, reports on postoperative testicular endocrine and exocrine function, indicate possible negative impact on fertility. Several studies following testicular torsions, even in those treated with orchiopexy, have shown evidence of significantly impaired exocrine testicular function (spermatogenesis), as measured by semen parameter changes (e.g., decreased sperm motility or morphology and reduced overall sperm count to a subfertility classification). Testicular torsion onset is infrequent with an annual incidence of 4.5 per 100,000 males <18 years old. Whereas, etiology of testicular torsion is not completely elucidated, several reports have shown seasonal variability in testicular torsion events, with a positive association between colder weather temperatures and onset of testicular torsion symptoms. Although seasonality of testicular torsion is inconclusive and controversial, several large studies conducted in different climates have indicated a clear correlation between increased frequency of testicular torsion to decreased ambient temperatures, suggesting they may play a role in the etiology of testicular torsion.

Keywords: Testicular torsion; Testis; Seasonality; Spermatic cord torsion; Spermatogenesis

INTRODUCTION

Testicular torsion, a twisting of the spermatic cord and its contents, is characterized by acute onset of testicular pain and swelling [1]. This presentation requires prompt diagnosis and urgent urological intervention, often surgical exploration within 4-8 hours, to avoid irreversible ischemic damage and loss of the testis [2]. Nonetheless, following either orchiectomy or orchiopexy to preserve the affected testis, several studies investigated postoperative testicular endocrine and exocrine function, indicate the consequence of testicular torsion might present a negative impact on fertility, with evidence of impaired spermatogenesis [3-5].

Testicular torsion onset is infrequent with an annual incidence of 4.5 per 100,000 males <18 years old [1]. Although etiology is not completely elucidated, some have postulated cold weather can cause the ascent of the testes, inducing hyperactivity of the cremasteric muscle reflex, leading it to retract the testis [6,7].

LITERATURE REVIEW

Numerous studies conducted in various climates worldwide, with differing annual temperature pattens examined the association between climate variables, as cold weather temperatures and onset of TT symptoms, yet evidence on the seasonality of testicular torsion is inconclusive and controversial.

Nonetheless, several reports have shown seasonal variability; evidence on a positive association between colder weather and onset of testicular torsion symptoms was reported in both cold

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regions as Scotland and warmer climatic regions as Taiwan and Brazil [8-10].

Three large studies in different climates, all reported on a significant seasonality presentation in testicular torsion events, predominately during winter months. A 25-year study conducted in Scotland reported on 7882 testicular torsion events, with significantly higher frequency during the colder months (November to April), also demonstrating an inverse correlation with the ambient temperature. Another large, 12-year study, from Brazil including 21,289 testicular torsion cases, found a significantly higher presentation during the coldest winter months (June-September). A 10-year nationwide study from Taiwan among 1782 testicular torsion cases, reported on highest rates of testicular torsion in January, demonstrating a significant peak in winter.

Similarly, we published our recent report that examined this association [11]. We, assessed the impact of seasonal variations in climate variables, (e.g., atmospheric temperature and humidity levels, collected from regional meteorological observation stations), on onset and laterality of testicular torsion events. Moreover, we attempted at correlating the temperature on the actual day of admission and at the approximate time of testicular torsion symptoms onset. We conducted a retrospective review, including 235 patients diagnosed and surgically confirmed with testicular torsion, during a 10-year study period. We found in both groups of children and adolescents 156 (66%) and in adults 79 (34%), a higher rate of testicular torsion occurrence in the colder fall and winter months. Moreover, although there were only 10.8% of cold days below 15°C, during the study period; we observed in both groups, a 3-fold significantly higher incidence of testicular torsion on these days of low temperatures below 15°C. Additionally, among children and adolescents, left sided testicular torsion was observed in the majority of these cases, suggesting a possible predilection for testicular torsion occurrence in cold weather, particularly left side laterality. An asymmetry of the testis has been described, primarily in adolescence, with a usual presentation of a lower left testis, with a longer cord than that of the right testis. This anatomical structure coincides with an increase in testicular weight and volume, during adolescence, may result in a higher incidence of left side testicular torsion among adolescents [12].

All clinically suspected cases of testicular torsion presented to our emergency department receive a sonographic confirmation, followed by surgical exploration of the scrotum to release the twisted cord, and to evaluate the viability of the testis. The majority of our patients (88%) were under 25 years old and only 15% of the cases underwent orchiectomy, as the testis was found nonviable or necrotic, much lower than reported orchiectomy rates which range from 32% to 71% [13]. While the majority (85%) of cases had undergone orchiopexy, to preserve viability of the affected testis, it is fixated to the scrotal wall, which further reduces the risk of testicular torsion recurrence.

DISCUSSION

As aforementioned, several studies assessed whether the consequence of testicular torsion might present a negative impact on fertility. Indeed, studies investigated postoperative testicular endocrine function following testicular torsion, with reports of higher FSH and LH levels in patients following orchiectomy compared to orchidopexy, although, testosterone levels were not affected [5,14,15]. The formation of Anti-Sperm Antibodies (ASA) is evident following trauma to the testis, thus an irre-versible autoimmune response is possibly triggered, due to testicular torsion. However, the impact of ASA on fertility is controversial and contradictory. Many studies following testicular torsion found no presence of ASA; while in others, elevated ASA levels were significantly correlated with low sperm count (<30 million/mL) [16]; yet others found the presence of ASA had no significant effect on semen quality and endocrine parameters [5].

Several studies reported exocrine testicular function (spermatogenesis) was significantly impaired following testicular torsion, even in those treated with orchiopexy. There are three main hypotheses explaining impaired spermatogenesis in these cases: Either a pre-existing congenital testicular dys-genesis, causing compromised contralateral testicular function, before the testicular torsion event; or ipsilateral reperfusion injury, combined with ischemic damage, causing high testicular oxidative stress; or as aforementioned, ASA formation triggered by an irre¬versible autoimmune response, due to break down of the hemato-testicular barrier during torsion of the spermatic cord, exposing sperm to the bloodstream [16]. Evidence of abnormal pathologies found in biopsies of the contralateral testis also suggest a pre-existing condition, possibly previous episodes of asymptomatic intermittent torsion [4].

Arap reported 25% of patients following testicular torsion were diagnosed with oligospermia [5]. Earlier studies reported 36% -39% of the patients following testicular torsion were classified as subfertile, with sperm counts <20 million/ml [3,4]. Thomas et al., also reported on abnormally low sperm morphology or motility in 64% of testicular torsion patients, specifically low total motile sperm count significantly correlating with duration of torsion [3]. The main factors determining testicular salvage found were interval from onset of testicular torsion symptoms until surgical exploration, as well as the degree of torsion [14]. High testicular salvage rates (90% to 100%) were achieved, when surgical exploration was performed within six hours after symptom onset, up to 12 hours of symptoms, rates decrease to 50%-80%, and over 24 hours salvage rates are further reduced to 10%-20% [1,4,13,17].

Mitochondrial function, plays a major role in sperm motility, with evidence of defective mitochondrial respiratory function in germ cells resulting in spermatogenesis impairment and infertility. An animal model study found evidence of preserved mitochondrial function in sperm cells, following testicular torsion with detorsion following one hour [18,19].

CONCLUSION

In conclusion, our study and several others have shown seasonal variability of testicular torsion with possible seasonal predilection for increased incidence of acute testicular torsion presenting in colder seasons. Moreover, several large studies

conducted in different climates have indicated a clear correlation between increased frequency of testicular torsion to decreased ambient temperatures, suggesting they may play a role in the etiology of testicular torsion.

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COMPETING INTERESTS

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