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The Effects of Testicular Torsion on Fertility

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Testicular torsion occurs primarily in either the neonatal or the adolescent period of life. The yearly incidence of testicular torsion in men under 25 years of age is 1 in 4000, but the overall risk of developing a testicular torsion by age 25 is 1 in 160. Because the overall risk is so high, the potential to impact the fertility of many young men is great. Neonatal torsion, which accounts for only 17% of testicular torsion, involves torsion of the testicle and surrounding tunica vaginalis (extravaginal torsion) and will not be discussed further in this chapter. In the intravaginal (postnatal) form of testicular torsion, the mechanism of injury involves contraction of the cremasteric fibers, which causes a rotatory force on the testicle around the axis of the spermatic cord while surrounded by a high-inserting tunica vaginalis. This condition more commonly involves the left testicle. The two peak incidences for intravaginal testicular torsion are ages 1 to 5 and 11 to 15. Seasonal variations in occurrence of torsion favor the colder months.

Testicular torsion is a true urologic emergency, requiring prompt diagnosis and surgical intervention. Testicular torsion, or torsion of the spermatic cord, causes compression of the spermatic vessels and impairs testicular blood flow. Preservation of testicular function requires timely detorsion and orchiopexy. Numerous clinical studies and animal investigations have attempted to elucidate the pathogenesis of testicular injury and long-term testicular dysfunction following testicular torsion, but the treatment of testicular torsion has remained relatively unchanged.

The standard of care dictates detorsion and contralateral orchiopexy within 6 hours of onset of symptoms, with orchiectomy if the testicle appears nonviable. Viability of the testicle is assessed by gross appearance or by demonstration of perfusion by incising the tunica albuginea. Detorsion within 6 to 10 hours increases the chance of salvage but does not guarantee preservation of function. Testicular injury may result from hypoxia during torsion or reperfusion injury following detorsion.

Recent advances in imaging studies have improved early diagnosis and management of testicular torsion. The nuclear testicular scan remains the best preoperative test, with an accuracy of 88% or greater in diagnosing torsion. Color-flow Doppler imaging can be equally successful in detecting absent perfusion (540° torsion) and even more sensitive in detecting reduced testicular flow due to a lesser degree of twisting (360° torsion). Doppler contrast agents and power Doppler technology can improve the accuracy of this test.

Despite prompt management, testicular torsion remains a known risk factor for infertility. This places testicular torsion in the cauldron of unilateral pathologies that mysteriously cause detriment to the contralateral testicle and lead to impaired spermatogenesis. Decreased sperm concentrations and increased follicle-stimulating hormone (FSH) levels have been demonstrated in men with loss of one testicle because of cryptorchidism, torsion, testicular cancer, or iatrogenic injury during herniorrhaphy, with no significant differences between groups based on etiology.
Clinical Studies

Clinical studies of testicular torsion have evaluated atrophy rates, fertility rates, histologic characteristics of the ipsilateral and contralateral testes, and evidence supporting an autoimmune phenomenon. Most studies agree that prepubertal men who experience torsion preserve fertility regardless of treatment modality, but postpubertal men are at greater risk for subsequent infertility, a risk correlated with duration of torsion. Many studies combine prepubertal and postpubertal populations, which can produce variable results. Additionally, definitions of testicular atrophy and normal semen parameters may vary. Histologic studies also vary in grading systems and techniques, with evaluations of semissections providing better testicular morphologic detail than paraffin embedment. Some dysplastic lesions require ultrastructural histologic techniques, such as electron microscopy or semithin sectioning, for visualization.

Testicular Atrophy

The rate of secondary testicular atrophy following detorsion and orchiopexy may be as high as 68%. A positive correlation between duration of torsion and percentage of atrophy has been demonstrated, because treatment delayed longer than 8 hours significantly increases the risk of testicular atrophy. Long-term follow-up studies indicate a significant secondary atrophy rate if the duration of torsion exceeds 24 hours. Torsion of less than 360° for up to 12 hours’ duration is better tolerated.

Subfertility

The effect of testicular torsion on spermatogenesis was first documented in 1978 by Krarup, who found a normal semen analysis on follow-up in only 1 of 19 patients. Up to 50% to 87% of men may experience abnormalities on semen analysis following unilateral torsion. Abnormalities on semen analysis at long-term follow-up may include oligospermia (35–57% of patients), asthenospermia (53–56%), and abnormal morphology (39–69%). Diminished paternity rates following unilateral testicular torsion have also been reported.

Following testicular torsion, elevated luteinizing hormone (LH) and FSH levels may be present in subfertile men. Anderson et al found elevated FSH levels in 40% of patients with oligozoospermia. A supernormal response of FSH to human chorionic gonadotropin (HCG) stimulation has been seen in patients following unilateral testicular torsion. This response correlates with the degree of oligospermia and reflects the abnormal spermatogenesis present in these patients.

Duration of torsion may correlate with the degree of abnormalities found on semen analysis and hormonal analysis, and fertility may be preserved in patients with early detorsion when compared with those who present late and require orchiectomy. FSH levels were elevated in 22% of patients who underwent detorsion and orchiopexy, compared with 71% with delayed diagnosis and orchiectomy. Other reports, however, have indicated no superiority in semen parameters of patients who underwent early detorsion and orchiopexy, and in the preservation of normal semen analyses for those who presented late and underwent orchiectomy. Some reports dispute the deleterious effects of torsion on spermatogenesis and fertility.

Histologic Examination

Nistal et al evaluated 109 biopsy and orchietomy specimens from the acutely torsed testes of postpubertal males and found that primary lesions, such as focal hypospermatogenesis, intratubular calcification, and Sertoli-cell–only tubules, were superimposed on lesions secondary to anoxia in only 14%. Horica et al reported preexisting testicular abnormalities in the contralateral testis of 7 of 7 patients with acute testicular torsion, and suggested these may represent congenital dysplasia or damage from recurrent intermittent testicular torsion. Hadziselimovic et al reported preexisting testicular abnormalities ranging from abnormal spermatogenesis to Sertoli-cell–only syndrome in 53% of the con-