Comparative Analysis of Detorsion Alone Versus Detorsion and Tunica Albuginea Decompression (Fasciotomy) with Tunica Vaginalis Flap Coverage in the Surgical Management of Prolonged Testicular Ischemia

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Purpose: Recent data suggest that testicular torsion may include an element of the compartment syndrome that improves with decompression. In 2009 we instituted tunica albuginea incision with tunica vaginalis flap coverage as an alternative in cases in which the torsed testis continued to appear ischemic after detorsion.

Materials and Methods: The medical records of 65 boys who underwent scrotal exploration for testicular torsion between 2000 and 2010 were reviewed. There were 6 patients excluded from study due to lack of followup. Of the remaining 59 patients 31 (52.5%) showed improvement in testicular appearance after detorsion and underwent orchiopexy, whereas 28 (47.5%) did not show evidence of recovery after detorsion. Of these patients 11 underwent tunica albuginea incision with tunica vaginalis flap coverage and 17 underwent orchiectomy. Demographic data, duration of symptoms and rate of testicular salvage were analyzed.

Results: Mean patient age was 11.8 years (detorsion plus orchiopexy), 10.1 years (tunica albuginea incision plus tunica vaginalis flap coverage) and 10.1 years (detorsion plus orchiectomy). Average followup was greater than 6 months in all groups. Mean duration of torsion was 13.4 hours (detorsion plus orchiopexy), 31.2 hours (tunica albuginea incision plus tunica vaginalis flap coverage) and 67.5 hours (detorsion plus orchiectomy). Before tunica albuginea incision with tunica vaginalis flap coverage was offered, the rate of orchiectomy was 35.9% (14 of 39) vs 15% (3 of 20) after this technique was introduced ($p < 0.05$). The rates of testicular salvage were 62.5% (detorsion plus orchiopexy), 54.6% (tunica albuginea incision plus tunica vaginalis flap coverage) and 0% (detorsion plus orchiectomy). Although the numbers are limited, it is likely that without tunica albuginea incision with tunica vaginalis flap coverage 6 of 11 testes would have been removed.

Conclusions: This preliminary experience suggests that tunica albuginea incision with tunica vaginalis flap coverage is a promising option for the management of clinically marginal torsed testes, enhancing salvageability after prolonged ischemia. We recommend considering this maneuver before performing orchiectomy in selected cases of testicular torsion.

Key Words: spermatic cord torsion, compartment syndromes, ischemia, reperfusion, child

Abbreviations and Acronyms

DT = detorsion
OP = orchiopexy
OX = orchiectomy
TAI = tunica albuginea incision
TT = testicular torsion
TVFC = tunica vaginalis flap coverage

Study received institutional Research Ethics Board approval.

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TESTICULAR torsion remains a fairly common emergency in pediatric urology, with important implications from medical as well as legal perspectives.[1] Contemporary clinical management of TT continues to rely on prompt evaluation, accurate diagnosis and surgical exploration.[2,3] To date, the most meaningful efforts in terms of testicular salvage rates have been based on early detorsion[4] and prevention (by proactively addressing intermittent torsion).[5,6]

The compartment syndrome has been increasingly recognized as important in potentiating the ischemic insult of various organs constrained by their natural envelopes. This phenomenon is well documented in the orthopedic and trauma literature, and has recently been described in other organs and tissues.[7] Once the perfusion of the compartment is compromised, a vicious cycle of hypoxia, anaerobic metabolism, edema, further pressure increase and capillary flow decrease occurs.[8,9] Conceptually the testicle is an organ at risk because of the characteristics of the tunica albuginea, a fairly strong and inelastic layer. As a result, tissue changes related to ischemia-reperfusion can lead to edema with decreased perfusion pressure, which may perpetuate the already compromised testicular blood supply.[10] A limited case series suggested that decompression of the tunica albuginea in humans may be beneficial in the reperfusion of the testicular parenchyma after detorsion, despite the lack of similar evidence in animal studies.[11,12]

The standard intraoperative management of TT consists of detorsion followed by orchiopexy or immediate orchiectomy depending on the subjective gross viability of the testicular parenchyma. Recent clinical data suggest that post-detorsion compartment syndrome (ie testicular compartment syndrome) may be amenable to decompression by generous incision of the tunica albuginea or fasciotomy.[12] Based on those results we introduced the tunica albuginea incision followed by tunica vaginalis flap coverage as a therapeutic alternative for testes that remain grossly ischemic after DT. We hypothesized that this intervention would help increase the testicular salvage rate with a consequent decrease in the number of orchiectomies. We present our initial experience with this approach, comparing it to a standard management historical group.

MATERIALS AND METHODS

Following institutional Research Ethics Board approval we retrospectively reviewed all cases of acute scrotal pathology that underwent surgical exploration during a 10-year period. Of these we included only children with unilateral intravaginal torsion of the spermatic cord with symptoms lasting at least 6 hours before exploration. Perinatal torsion cases were not included in the study due to differences in presentation, timing of surgery and rates of salvage. Similarly any cases of a solitary gonad, undescended testis and/or documented contralateral testicular pathology or atrophy were excluded from analysis to reliably report volume differences at followup. Only cases with a minimum of 1 documented followup visit were included. This strategy yielded identifiers for medical records of 65 patients (age range 1 to 17 years) treated between 2000 and 2010. The surgical technique was performed as described by Kutikov et al with few modifications.[12] The affected testicle was detorsed and wrapped in warm saline soaked gauze. Attention was then directed to the contralateral testis, which was evaluated and prophylactically pexed to prevent future torsion. The affected testis was then reevaluated after a period of observation and, if no improvement in color and appearance was noted, a generous longitudinal anterior incision of the tunica albuginea was made. If gross enhancement in parenchymal blood flow was observed (fig. 1), the defect of the albuginea was covered with a vascularized tunica vaginalis flap and the gonad was preserved (fig. 2). We did not attempt to measure intratesticular pressures in any of the patients as the potential results would not change management. All TAI+TVFC cases were systematically followed in the urology clinic with physical examination and Doppler scrotal ultrasound at least 4 weeks after surgery, while the remainder underwent routine monitoring as indicated by the treating physician.

Patient demographics, symptom duration, surgical technique and fate of the gonad were recorded. The primary outcome, salvage rate, was defined as a testicular volume of 50% or greater compared with a normal contralateral testis and the presence of parenchymal blood flow as measured by Doppler scrotal ultrasound. Testicular atrophy was diagnosed when one of the previously mentioned parameters was absent. When applicable, size discrepancy was calculated using Lambert's empiric formula, previously shown to correlate best with measured testicular volume.[13]

Descriptive statistics were analyzed with SPSS® version 17. Categorical variables were presented as proportions and continuous variables were summarized as means with standard deviations. Fisher's exact test was used to compare differences in proportions for the outcome of interest between groups. A p value of 0.05 or less was considered statistically significant.

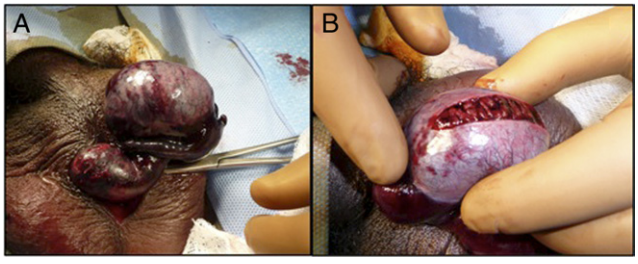

Figure 1. Intraoperative image depicting lack of testicular reperfusion after detorsion (*A*). Generous anterior incision of tunica albuginea (*B*). Note gross evidence of improved perfusion based on intraoperative appearance (color) of parenchyma.