

INVESTIGATIVE UROLOGY

Beneficial effect of taurine on testicular ischemia-reperfusion injury in rats

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Objectives: To evaluate the effect of taurine, a potent antioxidant, on testicular ischemia-reperfusion injury due to excess reactive oxygen species produced by neutrophils after testicular torsion-detorsion.

Methods: A total of 60 adult male Sprague-Dawley rats were randomly divided into three groups, each containing 20 rats. The control group underwent a sham operation of the left testis. In the torsion-detorsion group, the left testis was rotated 720 degrees counterclockwise for 2 hours. The treatment group underwent the same surgical procedure as the torsion-detorsion group, but taurine was administered intravenously at repair of the testicular torsion. One half of the rats in each group underwent orchietomy 4 hours after detorsion for measurement of myeloperoxidase activity, an indicator of neutrophil accumulation in the testis, and for evaluation of tissue malondialdehyde, an indicator of intratesticular reactive oxygen species content. The remainder were killed at orchietomy 3 months after detorsion for analysis of testicular spermatogenesis.

Results: Unilateral testicular torsion-detorsion caused a significant increase in myeloperoxidase activity and the malondialdehyde level and a significant decrease in testicular spermatogenesis in the ipsilateral testes. The decrease in ipsilateral testicular spermatogenesis involved a reduction in testicular weight, mean seminiferous tubular diameter, number of germ cell layers, and mean testicular biopsy score. The rats treated with taurine had a significant decrease in myeloperoxidase activity and malondialdehyde level and a significant increase in testicular spermatogenesis in the ipsilateral testes compared with the torsion-detorsion group.

Conclusions: The results of our study have shown that the administration of taurine exerts a beneficial effect on testicular ischemia-reperfusion injury. This effect might be partly the result of a reduction in reactive oxygen species generation by diminishing neutrophil recruitment to the testis.

Editorial Comment

Taurine (2-aminoethanesulfonic acid) is a major intracellular free beta-amino acid found in most mammalian tissues and is supposed to exerts cytoprotective properties such as antioxidation, intracellular calcium flux regulation, membrane stabilization, osmoregulation, and antiapoptosis. Exogenous administration of taurine has been shown to have a preventive and therapeutic effect on ischemia-reperfusion injury of the heart, liver, brain, and other organs. The authors investigated by the first time the role of taurine in testicular ischemia-reperfusion injury, by evaluating its effect on testicular spermatogenesis in a rat testicular ischemia-reperfusion injury model.

The authors demonstrated the beneficial effect of taurine on testicular ischemia-reperfusion injury. One part of the beneficial effect could be a result of a reduction of reactive oxygen species generation by diminishing the neutrophil recruitment to the testis.

The treatment with taurine (200 mg/kg) significantly rescued ipsilateral testicular spermatogenesis in the present study; nevertheless, the saved spermatogenesis was not restored to its normal value. Since the authors did not study the effect of taurine at different doses or different administration times, the effect of taurine could be affect by these aspects. So, additional studies taking into account these factors could led to elucidation of taurine's optimal effect.

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Microarray analysis of exstrophic human bladder smooth muscle

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Objective: To compare the genetic profiles of 'healthy' bladder smooth muscle cells (SMCs) and exstrophic SMCs (ESMCs) to identify genes that are over- and under-expressed in ESMCs, thus providing a molecular evaluation of the quality and therapeutic potential of ESMC tissue.

Patients, Material and Methods: Classical bladder exstrophy is a rare disorder, occurring in 1 in 30,000 live births. Studies have shown that exstrophic bladders are developmentally immature at birth. After surgical closure, the bladder typically undergoes abnormal remodelling (such as over-expression of collagen III) throughout early development. We hypothesized that the predominant genetic differences between normal SMCs and ESMCs are in the developmental genes. This hypothesis was tested by the use of microarray analysis. Bladder SM biopsies were taken from 'healthy' subjects undergoing bladder surgeries for other conditions (for example, urinary reflux) and patients with bladder exstrophy. Cells were expanded in vitro, and total RNA was isolated and hybridized to the Affymetrix U133A GeneChip (Affymetrix Inc., Santa Clara, CA, USA) by the Wake Forest University School of Medicine Affymetrix core facility, using standard protocols.

Results: We created a genetic signature consisting of 961 genes that are over-expressed and 432 genes that are under-expressed in ESMCs. Analysis of these signatures identified an over-expression of inflammatory genes and an under-expression of developmental genes.

Conclusion: Our data is in concordance with previous studies and histological data showing that ESMCs are developmentally immature relative to healthy bladder SM. The clinical implication of the ESMC genetic signature is that it provides a list of targets that can be (i) manipulated ex vivo and/or in vivo to induce differentiation (the completion of development) and (ii) used as biomarkers to explain the variability of the clinical symptoms after surgical closure.

Editorial Comment

This is another pioneer study from this group of investigators, which opened new windows on understanding and treatment of bladder exstrophy-epispadias complex (BEEC).

The authors used the microarray technique to identify the global genetic differences between bladder exstrophic smooth muscle cells (ESMCs) and normal bladder smooth muscle (SM) cells from patients who underwent surgery for other conditions (not age matched). The authors were able to create a genetic signature consisting of 961 genes that were over-expressed and 432 genes that were under-expressed in ESMCs.

The analysis of these signatures identified an over-expression of inflammatory genes and an under-expression of developmental genes.

The authors emphasized that the data on inflammatory genes shows the importance of keeping the bladder sterile after birth and would argue that an antibiotic should be given after birth. Also, the authors think that it is important to note any possible pathogen exposure before surgery as a way to identify patients that can potentially be at greater risk of complications, such as retention of inflammatory gene expression after in vitro expansion and fibrotic tissue that could be identified during development. The data on inflammatory over-expression could also explain why some patients have symptoms during childhood and others are asymptomatic. Concerning the inflammatory issue, the authors demonstrated the importance of keeping the bladder sterile after birth and argued that an antibiotic should be given after birth. They also think that it is important to note any possible pathogen exposure before surgery as a way to identify patients that can potentially be at greater risk of complications.

Concerning developmen, the present microarray analysis shows that ESMCs are developmentally immature relative to healthy SMCs. This issue was already demonstrated previously, nevertheless, the present data is data is original because it gives a molecular explanation, identifying the presence of key developmental pathways such as IL-6 and Wnt. This is further validated by the under-expression data set, which was comprised of several biosynthetic processes.

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