

INVESTIGATIVE UROLOGY

The Complex Structure of the Smooth Muscle Layer of Spermatic Veins and Its Potential Role in the Development of Varicocele Testis

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Objectives: Varicocele, a dilatation of the pampiniform venous plexus, is considered to cause male infertility. The exact mechanism of varicocele development is not clarified yet. This study focused on the structure of varicocele veins, compared with normal spermatic veins, and its potential role in varicocele development.

Methods: Morphologic and immunohistochemical studies using antibodies against vWF and neurofilament-200 (NF-200) were performed on spermatic vein fragments of 20 varicocele patients and 40 normal spermatic cords. Casting preparation of veins was performed on five normal spermatic cords.

Results: Casting preparation frequently revealed circular constrictions of normal spermatic vein lumina. Histologic evaluation showed a strong longitudinal smooth muscle layer in the adventitia of large veins in addition to the circularly organised tunica media. Serial sections showed smooth muscle fibres branching from the outer longitudinal into the inner circular layer. Immunostaining for vWF revealed high vascularisation of this outer layer. Interestingly, the number of nerve fibres marked by NF-200 immunostaining was considerably higher in large veins compared to the testicular artery. The longitudinal smooth muscle layer was significantly degraded in the presence of varicocele grades I and II, and did not even exist in varicocele grade III. Correspondingly, the number of vasa vasorum and nerve fibres was reduced in varicocele veins.

Conclusions: Our data show a complex smooth muscle organisation of spermatic veins, which serves the basis for a contractile mechanism, providing an effective blood transport through pampiniform plexus. This mechanism is obviously damaged in the varicocele. Molecular processes behind this impairment remain to be clarified.

Editorial Comment

The authors of this interesting and original study aimed to assess whether there are anatomic and structural differences between normal spermatic veins and varicocele veins, and whether these differences might serve as a basis for an explanation of the development of varicocele.

They demonstrated by the first time that the anatomic structure of the large spermatic veins of the pampiniform plexus is composed of a strong longitudinal smooth muscle layer in the tunica adventitia with oblique muscle fibers that reach the inner circular smooth muscle layer of the tunica media. The authors proposed that this assemblage of muscle layers could lead to a mechanism of peristaltic venous transportation. This contractile function apparently is disturbed in varicocele by morphological changes of the venous wall that may lead to impairment of blood venous return, promoting the development of varicocele.

The take home message of this paper is that the morphologic changes of the venous wall of spermatic cord veins, including a degeneration of the outer smooth muscle layer, lead to an impairment of the contractile function and blood return of the veins, promoting the development of varicocele testis.

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An Electron Microscopic Examination of the Intravesical Ureter in Children with Primary Vesico-Ureteric Reflux

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Objective: To determine the structure of the intravesical distal ureteric wall of patients with primary vesico-ureteric reflux (VUR), and to compare the findings with previous reports.

Materials and Methods: Specimens of the distal intravesical ureteric segments were taken surgically from children undergoing ureteric reimplantation surgery for primary VUR. There were 24 distal intravesical ureteric specimens from 15 children (nine female and six male). Ultra-thin sections were cut from the specimens and examined with a transmission electron microscope.

Results: The appearance of the muscular layers of the specimens of different grades differed markedly. There were intercellular oedematous areas in the muscular layer in specimens from patients with grade 2 and 3 VUR. In specimens from grade 4 VUR there were also intracytoplasmic vacuoles in the smooth muscle cells. The most marked and striking changes were in the specimens from children with grade 5 VUR, in which there were large intercellular oedematous areas and prominent large intracytoplasmic vacuoles.

Conclusion: Refluxing ureters differ from normal ureters in having disorganized smooth muscle fibres and altered smooth muscle cell structure, leading to incompetence of the valve mechanism. Although we cannot confirm that these pathological changes in the smooth muscle layer of the intravesical ureteric wall are caused by VUR we conclude that, with increasing degrees of reflux, the degree of smooth muscle damage increases, and that the rate of spontaneous resolution decreases.

Editorial Comment

The authors taken specimens of intravesical distal ureteric segments surgically removed from children undergoing ureteric reimplantation due to primary vesicoureteral reflux (VUR) of different degrees. They studied by histological methods and for the first time by transmission electron microscopy (TEM), the structure and structural changes of the specimens. The results were compared with controls and with the grades of VUR.

The authors found no marked differences in the morphology of the tunica adventitia, and no pathology was detected. The structure and distribution of collagen fibers, fibrocytes and fibroblasts in the adventitia were similar in all specimens. The transitional epithelial cells were closely arranged in the tunica mucosa and the submucosa contained collagen fibers, fibrocytes and fibroblasts in variable proportions. Further, the morphology of the lamina propria and the tunica mucosa were similar in all specimens, and no ultrastructural change or pathology was detected.

On the other hand, the findings demonstrated that the appearance of the muscular layers of the specimens differed markedly with VUR grade. The distribution of intracytoplasmic vacuoles in smooth muscle cells and intercellular edema are clearly shown by semi-quantitative methods. Intercellular edema was sparse in specimens of grade 2–3 VUR, moderate in specimens of grade 4 and common in specimens of grade 5. Intracytoplasmic vacuoles were absent in specimens of grade 2–3 VUR, sparse in grade 4 and common in grade 5.

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