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Electron Microscopic Evaluation of the Urethroileal Junction and Proximal Urethra in Females With Hypercontinence Following Orthotopic Ileal Neobladder Diversion

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ABSTRACT

INTRODUCTION: Hypercontinence following orthotopic bladder diversion occurs in up to 40% of female patients. Its cause is still debated. The purpose of the study was to compare the histological makeup of specimens biopsied from the urethroileal junction and proximal urethra in female patients with normal voiding patterns and hypercontinence following orthotopic diversion.

METHODS: The participants were 11 females who had received orthotopic diversion after radical cystectomy with a Hautmann small intestinal neobladder. One year after the surgery, 5 patients were normally voiding without significant residual and 6 patients were hypercontinent (defined as voiding with > 150 mL residual urine or inability to void). All patients had cystoscopy and biopsy from the urethroileal junction and proximal urethra. A specially configured transurethral resection loop with a very small V-shaped tip was used to minimize the biopsy. The specimens were subjected to hematoxylin and eosin stain for light microscopy and processed for electron microscopy examination. Specimens from the 2 groups were compared for: (1) presence or absence of smooth muscle fibers, their number, and their orientation; (2) presence or absence of nerve fibers and their number.

RESULTS: Examination of the specimens from both groups showed only areas of connective tissue with scattered myelinated nerve fibers and smooth muscle fibrils. No obvious difference was found between patients with normal voiding characteristics and patients with hypercontinence regarding the number or orientation of smooth muscle fibers or nerve fibers.

CONCLUSION: The high incidence of hypercontinence in females undergoing cystectomy and orthotopic diversion could not be attributed to a difference in histological architecture in the area of the urethroileal anastomosis and the proximal urethra in this small sample. The level of urethral resection appears to be the primary evidence-supported cause of this condition.

KEYWORDS: Hypercontinence; Females; Orthotopic diversion

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original study

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INTRODUCTION

The application of an orthotopic bladder for patients who have cystectomy was in the minds of generations of urologists, but it did not become a reality until 1979 when Camay popularized the technique through his work on Camey I and II in males [1]. Different techniques and variations have been developed; all share the same concept of achieving a urinary diversion that resembles the normal voiding pattern physically, physiologically, and psychologically.

The excellent clinical and functional results achieved in male patients stimulated efforts to provide females requiring lower urinary tract reconstruction a similar form of diversion [2]. Unfortunately, poor understanding of the anatomical and physiological aspects of the lower urinary tract in females and fear of inducing incontinence hindered these efforts.

Many studies conjoined to achieve a better understanding of the oncological and functional outcome of applying orthotopic bladder diversion in females [3-5]. Their results showed that instead of the feared *incontinence*, a puzzling *hypercontinence* was faced, with an incidence up to 40%. Its cause is still a point of debate. The purpose of the present study was to compare the histological makeup of specimens biopsied from the urethroileal junction and proximal urethra in female patients with normal voiding patterns and hypercontinence following orthotopic diversion.

METHODS

The prospective study was approved by the scientific committees of the author's department and institute. All participants provided written informed consent.

Participants

The participants were 11 females who had surgery for orthotopic diversion after radical cystectomy with a Hautmann small intestinal neobladder. The condition of continence was defined after 1 year of clinical, laboratory, and ultrasound, and urodynamic follow-up evaluations. At the end of 1 year, 5 patients were normally voiding without significant residual and 6 patients were hypercontinent. *Hypercontinence* was defined as voiding with > 150 mL residual urine or inability to void. The level of hypercontinence was estimated during cystometry rather than ultrasound; accurate measures are difficult to obtain from ultrasound because of the presence of folds of bowel loops used for orthotopic bladder reconstruction. The mean age of the patients that were normally voiding was 54.2 years (range, 43-67 years); the mean age of the patients with hypercontinence was 52.6 years (range, 44-63 years).

Procedures

All patients had cystoscopy and biopsy from the urethroileal junction and proximal urethra 1 year after the neobladder construction surgery. The surgeon used a specially configured transurethral resection (TUR) loop with a very small V-shaped tip to minimize the size and effects of the biopsy.

The biopsied specimens were subjected to hematoxylin and eosin stain for light microscopy, and a special billet containing tiny pieces of the specimens (about 1 mm^3 each) was fixed for electron microscopy examination. An FEI/Philips EM208S Transmission Electron Microscope (FEI Electron Optics BV, Eindoven, The Netherlands) was used.

Analysis

The histological architecture of the specimens was examined by 2 independent investigators who were blind to the participant's group. Specimens from the 2 groups were then compared for: (1) presence or absence of smooth muscle fibers, their number, and their orientation; (2) presence or absence of nerve fibers and their number.

RESULTS

Examination of the tiny specimens from both groups showed only areas of connective tissue with scattered myelinated nerve fibers and smooth muscle fibrils. No obvious difference was found between patients with normal voiding characteristics and patients with hypercontinence regarding the number or orientation of smooth muscle fibers or nerve fibers. Specimen examples for patients with normal voiding pattern are contained in Figure 1; examples for patients with hypercontinence are contained in Figure 2.

DISCUSSION

Hypercontinence is a puzzling problem in females with orthotopic diversion. Its incidence ranges between 5% and 50% in different series [6-10], and the etiology is still debatable. Different etiologies have been proposed: (1) urethral angulation with increased urethrointestinal angle due to lack of posterior support for the pouch [6]; (2) functional obstruction due to denervation of the urethral smooth muscles [11]; (3) the level of urethral resection [2,7,12]; (4) the ileal valve [13,14]; and (5) false voiding technique [15].

Studies have been done using electron microscopy in cases of stress and mixed urinary incontinence to verify if there are ultrastructure differences between patients with normal voiding and incontinence [16,17]. No previous work has been done to determine if there are differences in the anatomical

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Figure 1. Three Examples of Histological Specimens for Patients with Normal Voiding Pattern (Electron Microscope). doi: 10.3834/uij.1944-5784.2010.10.10f1

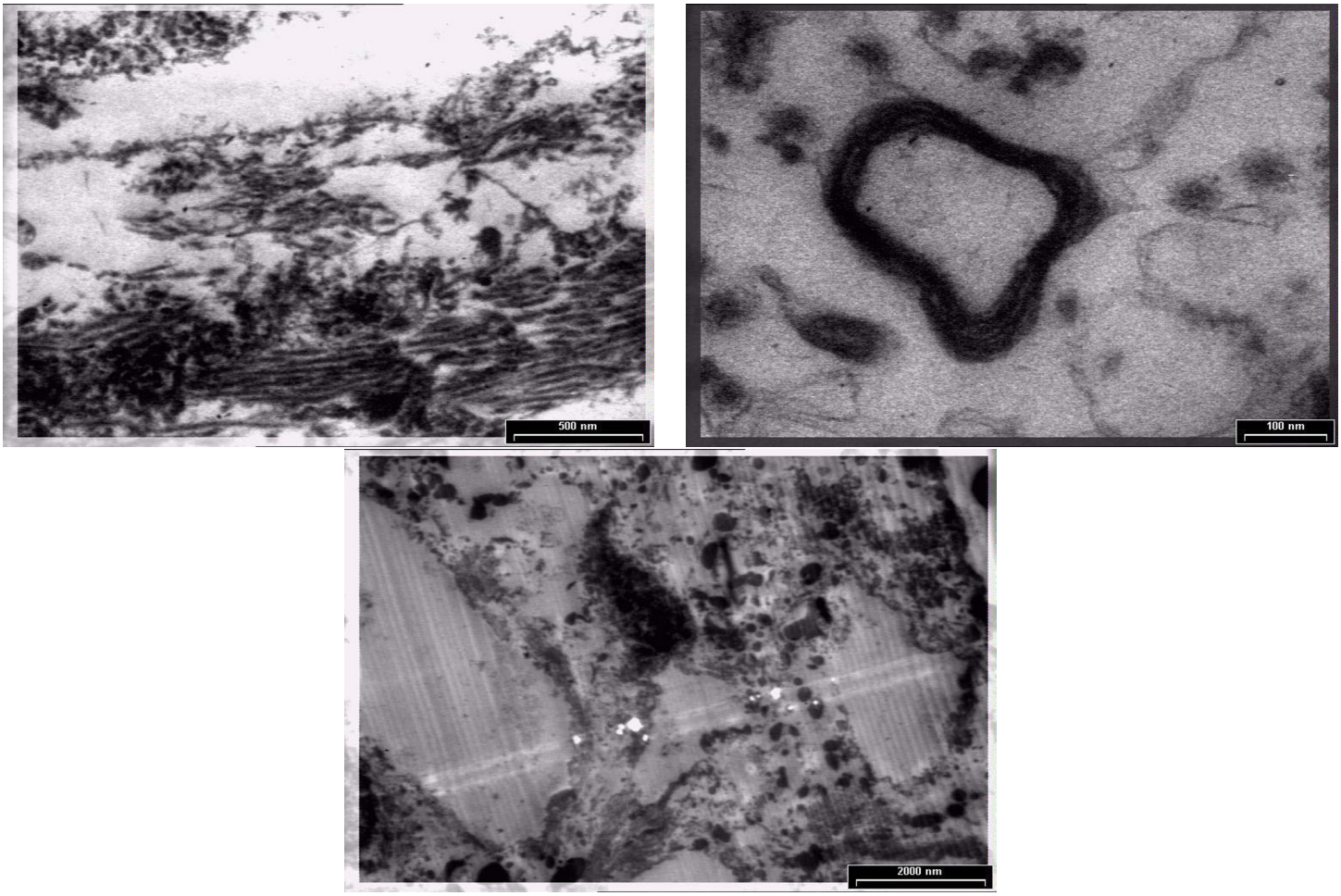
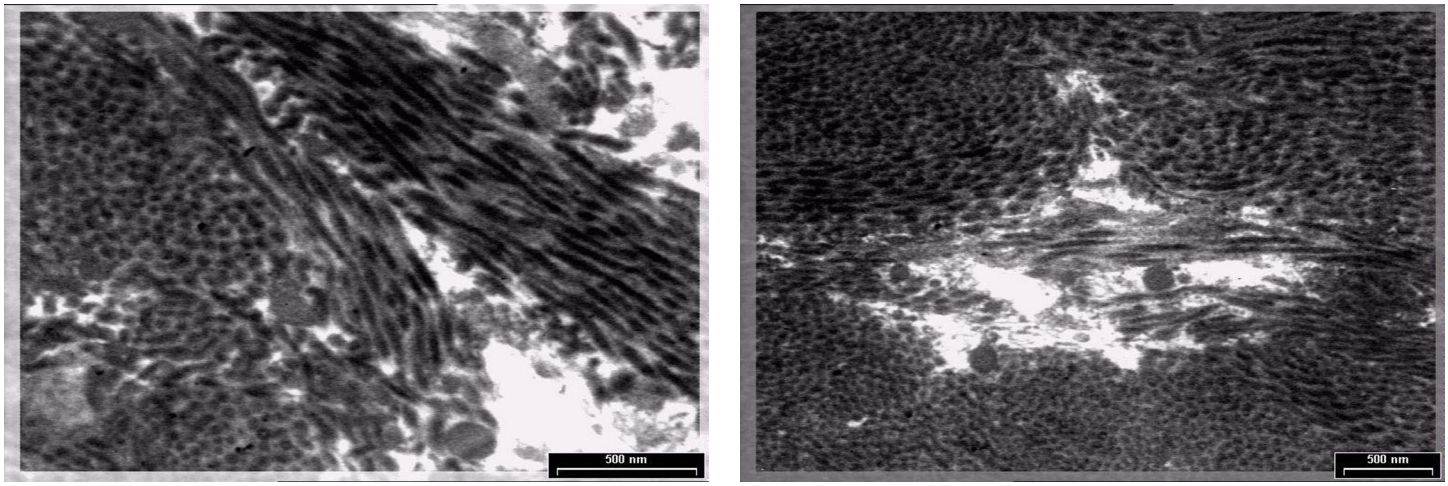


Figure 2. Two Examples of Histological Specimens for Patients with Hypercontinence (Electron Microscope). doi: 10.3834/uij.1944-5784.2010.10.10f1



and histological architecture in the area of the urethroileal anastomosis and the proximal urethra after orthotopic diversion that may explain the occurrence of hypercontinence. The results of the present study show that there was no histological difference between the 2 groups of patients and no clear reason such as fibrosis that could be the cause of hypercontinence. It should be noted that the study had a small number of patients and further research may be needed.

We believe that the primary cause of hypercontinence is the level of urethral resection. As stated in our previous work [2], the higher the level of resection the higher the incidence of hypercontinence. Loss of the normal coordinated micturition reflex where relaxation of the striated sphincter and contraction of the longitudinal smooth muscle opens the way for micturition leads to the presence of a urethra with a fixed tone that does not open with trials of evacuation. The higher incidence of hypercontinence in females when compared with males appears to be due to the presence of the extra tone of the urethral smooth muscles, because both have an intact striated sphincter.

CONCLUSION

The high incidence of hypercontinence in females undergoing cystectomy and orthotopic diversion could not be attributed to a difference in histological architecture in the area of the urethroileal anastomosis and the proximal urethra in this small sample. The level of urethral resection appears to be the primary evidence-supported cause of this condition.

Conflict of Interest: none declared

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