

Objective Long-Term Evaluation after Bladder Autoaugmentation with Rectus Muscle Backing

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Abbreviations and Acronyms

CIC = clean intermittent catheterization

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Purpose: Bladder autoaugmentation with rectus muscle backing is an efficient surgical technique for bladder augmentation. We evaluated long-term outcomes to determine the value of this procedure.

Materials and Methods: Between August 1999 and June 2004 autoaugmentation was performed in 16 girls and 7 boys 4 to 13 years old (median age 8). The indication was neurogenic bladder with small capacity and poor compliance due to myelomeningocele in 18 patients, tethered cord in 3 and sacral agenesis in 2. Detrusorectomy usually involved the whole upper half of the bladder. The prolapsed bladder urothelium was hitched to the 2 rectus muscles to prevent retraction and provide easier bladder emptying with voluntary muscle contractions.

Results: At the median early followup of 27 months (range 9 to 49) bladder volume had increased significantly in all 23 patients (median 338 ml, range 190 to 462). At the current median long-term followup of 134 months (range 94 to 159) bladder volume continued to be significant compared to median bladder capacity preoperatively (median 419 ml, range 296 to 552). Voluntary voiding was achieved in 14 patients without post-void residual urine. Nine patients used clean intermittent catheterization, of whom only 4 could not empty the bladder voluntarily and relied only on clean intermittent catheterization.

Conclusions: Detrusorectomy with a rectus muscle hitch and backing is a minimally invasive, completely extraperitoneal, simple and safe procedure. However, the technique is indicated only in select cases without anterior abdominal wall anomalies.

Key Words: urinary bladder, neurogenic; rectus abdominis; urothelium; reconstructive surgical procedures; urination

BLADDER augmentation represents a technique of choice in the management of lower urinary tract dysfunction, resulting in increased bladder capacity and compliance.¹ Enterocystoplasty is frequently performed as the most effective procedure to achieve an adequate urine reservoir. However, due to possible

complications such as mucous production, metabolic disturbances, neoplastic risks and surgical complications the ideal material or tissue for bladder augmentation remains to be discovered.² Bladder autoaugmentation, consisting of detrusor myotomy or detrusorectomy, was proposed as an alternative to increase bladder

capacity by creating a large bladder diverticulum.³ The main disadvantages are poor mechanical support to the prolapsed mucosa as well as possible shrinkage. To solve this problem several groups reported the results of using pedicled, detubularized and deepithelialized colonic or gastric segments to cover and also support the bulging urothelium.⁴⁻⁶

We previously reported our initial results of using the rectus muscle for the hitching and backing of completely freed, elastic and thin prolapsed urothelium after detrusorectomy.⁷ However, doubts remained about the reliability and long-term efficacy of this technique. Thus, we evaluated our patients who underwent bladder autoaugmentation with rectus muscle backing and present long-term functional results.

MATERIALS AND METHODS

Between August 1999 and June 2004 bladder autoaugmentation with rectus muscle backing was performed in 16 girls and 7 boys with a median age at surgery of 8 years (range 4 to 13). The indication was neurogenic bladder with small capacity and poor compliance that was resistant to previous management with anticholinergics.

We retrospectively evaluated the medical records for indications for surgery, age at surgery, outcomes, complications and additional procedures. Of the children 18 had myelomeningocele, 3 had tethered cord and 2 had sacral agenesis. Preoperatively all patients presented with hydronephrosis and vesicoureteral reflux, which was unilateral in 14 and bilateral in 9. Five patients with grade I or II reflux were treated conservatively, 14 with grade III or IV underwent endoscopic correction preoperatively and in the remaining 4 with grade V reflux extravesical ureterocystoneostomy was combined with autoaugmentation. Continent vesicostomy (Mitrofanoff procedure) was created in 5 patients who could not perform CIC due to lack of motor skills or a sensitive urethra. Five incontinent patients did not undergo a bladder neck procedure.

At operation autoaugmentation was performed as previously described⁷ using an inferior midline longitudinal or transverse (Pfannenstiel) incision and extraperitoneal dissection. A Foley catheter was placed to fill and empty the bladder, and measure changes in bladder capacity during the procedure. The fascia was divided and the rectus muscles were exposed and separated from each other in the midline. Each rectus muscle was dissected up to the umbilical region to allow for better mobility with care taken to preserve the main blood supply originating from the epigastric vessels. The peritoneum was then dissected dorsal, exposing the posterior bladder wall and the urachus, which was divided and ligated. The detrusor was incised longitudinally in an anteroposterior direction over the dome. After the uroepithelium was exposed through the detrusor opening the detrusor dissection was extended to involve anterior, posterior and lateral bladder surfaces. Dissection was performed through the submucosal layer with the bladder semifilled to prevent epithelial

perforation. In addition, some muscle fibers were left in place for additional support of the bulging mucosa (fig. 1). Approximately a third of the detrusor was removed except in cases with a thick detrusor, in which half of the muscle was excised. This was done in 4 of our patients.

Subsequently the bladder was emptied. Epithelium was fixed to the posterior surface of the rectus muscle by multiple interrupted 5-zero monofilament absorbable stitches. Detrusor fibers remaining after dissection and the urachal remnant were used for additional fixation to avoid urothelial perforation (fig. 2). The detrusor edges were fixed to the lateral margins of the rectus muscle. Each muscle was approximated in the midline so that the bladder was fixed and hung on the rectus muscle to prevent urothelial retraction and later shrinkage (fig. 3).

The anterior abdominal wall was closed in standard fashion. The Foley catheter remained indwelling for 10 days in an elevated position 30 cm above the patient to enable partial bladder distension during the healing process. Bladder cycling was also started immediately to prevent shrinkage. The catheter was clamped for 1.5 hours on the first 3 days and then opened every 2.5 hours on the following days to empty the bladder.

In addition to autoaugmentation, 5 patients simultaneously underwent a Mitrofanoff procedure and 4 underwent extravesical ureterocystoneostomy. All patients received anticholinergics during year 1 postoperatively. At early followup only 7 patients required anticholinergic treatment while at last followup it was no longer administered in any patient. Patients were evaluated by clinical studies, ultrasound and urodynamics at 6 and 12 months, and yearly thereafter with annual voiding cystourethrograms/radionuclide cystograms (fig. 4).

Bladder capacity was defined as maximum tolerated bladder filling or volume at leakage.^{8,9} Volume for age was calculated using the formula, volume in ml = (age in years \times 30) + 30, as proposed by Koff.¹⁰ The nonparametric Freidman and Wilcoxon tests for related samples were used for statistical analysis with $p < 0.01$ considered statistically significant.

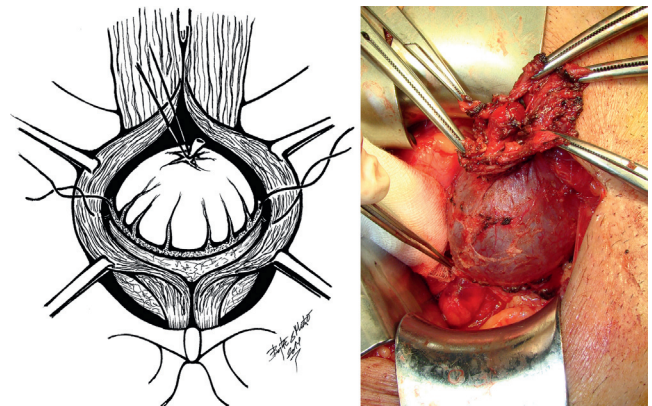


Figure 1. Detrusor is dissected and removed from upper part of bladder. Some muscle fibers are left for later urothelial suturing to rectus muscle. Detrusor edges are sutured to lateral margins of each rectus muscle.

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