Effects of Reconstructive Surgery on Bladder Function in Patients with Anorectal Malformations

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Purpose: Bladder dysfunction is common in patients with anorectal malformations and can be congenital or acquired as a consequence of surgery. We investigated the effects of surgical correction of anorectal malformations on bladder function.

Materials and Methods: The charts of all 341 patients who underwent surgery at our center between 1990 and 2010 were retrospectively analyzed for preoperative and postoperative videourodynamics. A total of 52 patients were eligible for study inclusion. Each assessment was scored according to International Children's Continence Society standards.

Results: Urodynamic study indicated normal bladder function preoperatively in 36 patients (69%) and postoperatively in 37 (71%). Median bladder emptying efficiency and relative bladder capacity changed significantly after posterior sagittal anorectoplasty. Bladder function according to International Children's Continence Society standards did not change postoperatively in 43 patients (83%). In 1 of 4 patients with deterioration of bladder function the deterioration could be attributed solely to surgery. Clinical outcome was available in 38 patients and showed complete urinary continence with spontaneous voiding in 24 (63%). Seven of 25 patients (28%) with preoperative videourodynamics indicating normal bladder function demonstrated dysfunctional voiding at latest followup.

Conclusions: Urodynamic and clinical outcomes after anorectal malformation repair are good, with 63% of patients being continent of urine. Urodynamic studies are of limited value in preoperative settings in these patients. Current techniques of reconstructive surgery for anorectal malformations seem to preserve bladder function in the majority of patients.

Key Words: anorectal anomalies; urinary bladder, neurogenic; urinary incontinence; urodynamics

Abbreviations and Acronyms

ARM = anorectal malformation

CIC = clean intermittent catheterization

DSD = detrusor sphincter dyssynergia

ICCS = International Children's Continence Society

PSARVUP = posterior sagittal anorectovaginourethroplasty

TUM = total urogenital mobilization

VUDS = videourodynamic study

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CONGENITAL anorectal malformations comprise a spectrum of anomalies ranging from mild to complex anatomical abnormalities.[1] In mild malformations a fistula is found between the rectum and the perineum (rectoperineal fistula). The spectrum continues from rectourethral fistula to bladder neck fistula in males, and from vestibular fistula to cloacal malformation in females. Mild and complex malformations are usually repaired in the first years of life. Currently the most widely used

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technique to repair anorectal malformations is posterior sagittal anorectoplasty, introduced by Peña and Devries in the 1980s.[2] In some cases, eg bladder neck fistula, this method is combined with laparotomy or laparoscopy for more extensive dissection. For the repair of cloacal malformation the posterior sagittal anorectoplasty is extended with either vaginourethroplasty to divide the urogenital sinus or total urogenital mobilization to mobilize the urogenital sinus en bloc to reach the perineum.[3,4]

The aim of surgical correction is to achieve optimal anorectal, urological and gynecologic function. However, in patients with ARMs bladder dysfunction is often encountered preoperatively and postoperatively. Long-term followup reveals that 24% to 52% of patients with ARMs suffer from severe bladder dysfunction, which may result in urinary incontinence, recurrent urinary tract infections and, in some instances, end-stage renal failure.[5–7] Controversy surrounds the question of whether bladder dysfunction is congenital or the result of surgery in patients with ARMs.[8,9] We investigated whether anorectal reconstruction itself influences bladder function in patients with ARMs.

PATIENTS AND METHODS

The database of our pediatric urology department was retrospectively queried for patients with ARMs who were operated on between 1990 and 2010. Of 341 patients 52 underwent VUDS before and after reconstructive surgery. In general these were patients with more complex malformations, in whom urodynamic studies were conducted according to protocol. In most patients with mild malformations preoperative and postoperative VUDSs were not conducted unless urological status indicated the need for urodynamics.

Patient records were screened for congenital lumbosacral bone deformities, spinal cord anomalies diagnosed by ultrasound or magnetic resonance imaging, mental disabilities and urological anomalies. VUDS was carried out according to standardized protocol following international guidelines.[10] Bladder emptying efficiency was calculated as voided volume divided by voided volume plus residual volume. Relative bladder capacity was calculated as measured bladder capacity divided by expected bladder capacity. Expected bladder capacity was calculated according to the formula, $30 + (30 \times \text{age in years}) = \text{capacity in ml}$.[11]

Bladder function according to VUDS was scored by a pediatric urologist (KPW) using a classification derived from International Children's Continence Society standards.[12] Bladder function was classified as 1—normal, 2—detrusor underactivity, 3—detrusor overactivity or 4—detrusor sphincter dyssynergia. Clinical urological outcome during the most recent followup was documented. For analyses we compared preoperative and postoperative data. Statistical analyses were done using SPSS®, version 17. Medians were compared using the Wilcoxon signed-rank test.

RESULTS

Patient Characteristics

ARMs were diagnosed as perineal (3 patients), bulbar rectourethral (4), prostatic rectourethral (20) and bladder neck fistula (3) in male infants and as vestibular fistula (12 patients) and cloacal malformation (10) in females. Sacral bone deformities were seen in 23 patients (44%). Spinal cord anomalies were seen in 6 patients (12%), and 5 (10%) had combined sacral and spinal anomalies. Abnormalities in renal anatomy were observed in 12 patients (24%) and hypospadias in 6 males. Trisomy 21 was seen in 3 patients (6%), and 3 patients had unspecified mental retardation without chromosomal anomalies.

Surgical reconstruction was performed at a median age of 10 months (range 2 to 31). In all patients a posterior sagittal approach was used for reconstructive surgery.[2,3] Four of 10 patients with a cloacal malformation underwent PSARVUP, while TUM was done in 6. In 9 of 52 patients (17%) the posterior sagittal approach was combined with laparotomy and in 6 (12%) with laparoscopy for extensive rectal mobilization.

Videourodynamics

Preoperative VUDS was conducted at a median age of 5 months (range 0 to 19). Median time between surgery and postoperative VUDS was 7 months (range 0 to 83). Median bladder emptying efficiency decreased from 88% (range 0% to 100%) preoperatively to 53% (0% to 100%) postoperatively ($p = 0.021$). Relative bladder capacity increased from 121% (range 18% to 273%) to 139% (19% to 390%) after the posterior approach ($p = 0.017$). Vesicoureteral reflux was observed in 22 patients (42%) preoperatively and in 20 (39%) postoperatively. Of the 22 patients with preoperative reflux 13 had persistent reflux following surgery. Furthermore, 7 patients with no reflux preoperatively were observed to have reflux during postoperative VUDS.

Preoperative bladder function according to ICCS standards was interpreted as normal in 36 patients (69%), while overactive detrusor function was seen in 15 (29%) and DSD was seen in 1 (2%, table 1). After posterior sagittal reconstruction bladder function was interpreted as normal in 37 cases (71%), underactive detrusor function in 2 (4%), overactive detrusor function in 11 (21%) and DSD in 2 (4%, table 1). In 9 patients (17%) bladder function according to urodynamic outcome had