

Bladder Augmentation Why and How?

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Bladder augmentation is a surgical procedure that is performed so that the bladder can safely store larger amounts of urine without causing high pressures or urinary leakage. It is performed for people who have otherwise untreatable urinary incontinence (leakage) or dangerous bladder conditions that may damage kidney function. The goals of these procedures are to improve a person's long term health and quality of life.

Indication for bladder Augmentation are Anatomically/structurally contracted bladder (tuberculous contracted bladder, radiation cystitis and schistosomiasis), Neurogenic bladder due to spina bifida, spinal cord injury and multiple sclerosis. Other indications for bladder augmentation are overactive bladder.

There are many techniques to choose for bladder augmentation surgery, such as ileocystoplasty, T-Pouch Hemi Kock Procedure, Colocystoplasty and Sigmoidocystoplasty, gastrocystoplasty, ureterocystoplasty and autoaugmentation.

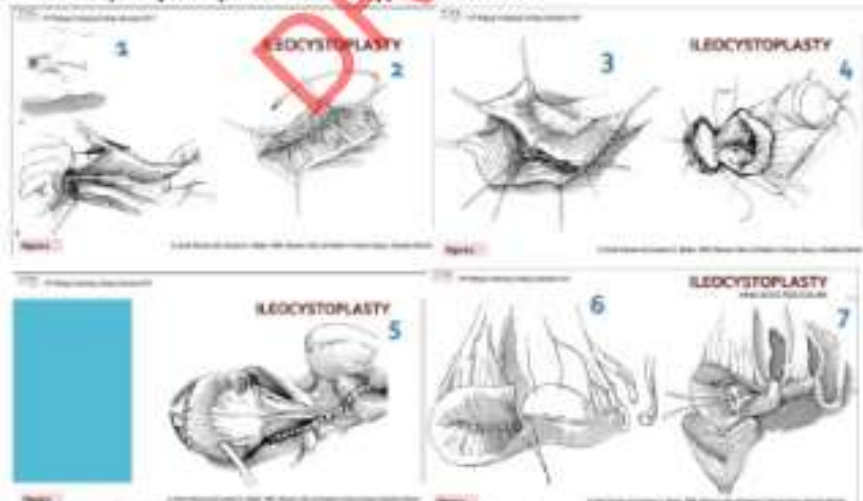


Figure 1. Ileocystoplasty Technique, surgical enlargement of the bladder using a segment of the bowel. During surgery the top or dome of the bladder is opened and a segment of bowel tissue is inserted to make a larger capacity bladder. The two ends of bowel will be rejoined and will continue to function normally. Jr, Frank Hinman and Laurence S. Baskin. 2009. *Hinman's Atlas of Pediatric Urologic Surgery*. Saunders Elsevier.

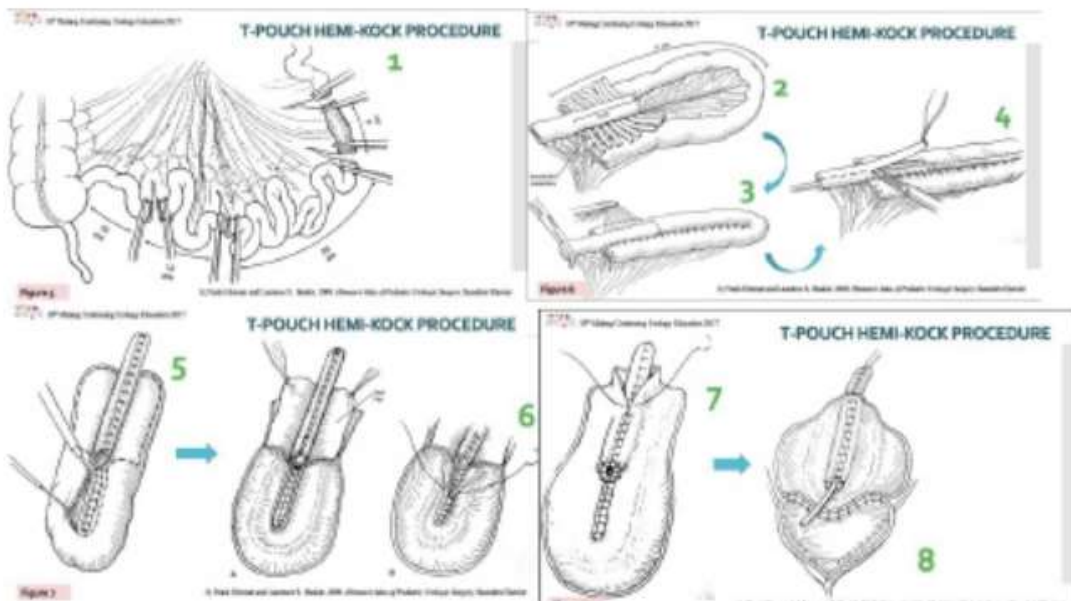


Figure 2. Construction T-Pouch Hemi-Kock Procedure
 Jr, Frank Hinman and Laurence S. Baskin. 2009. *Hinman's Atlas of Pediatric Urologic Surgery*. Saunders Elsevier

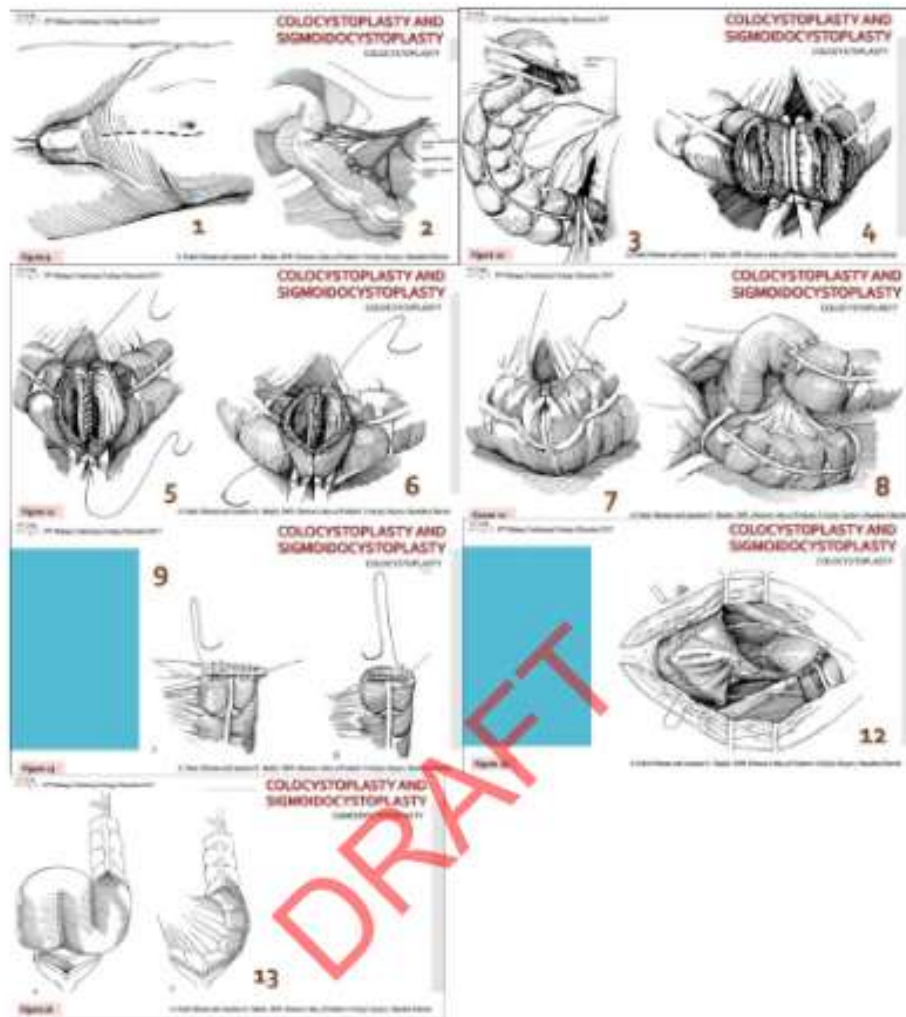


Figure 3. Colocystoplasty and Sigmoidocystoplasty Technique
 Jr, Frank Hinman and Laurence S. Baskin. 2009. *Hinman's Atlas of Pediatric Urologic Surgery*. Saunders Elsevier

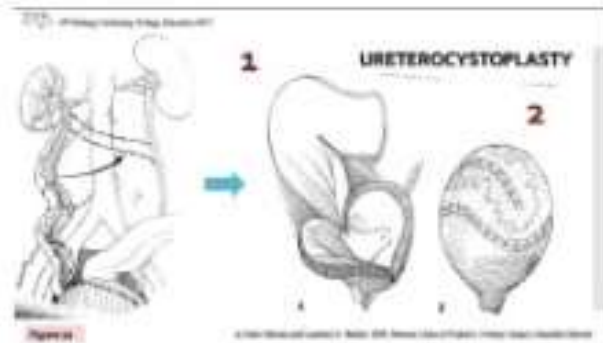


Figure 4. Ureterocystoplasty technique required detubularization of the dilated ureter, taking care to preserve the blood supply and then the detubularized ureter is reconfigured before being anastomosed to the bladder
 Jr, Frank Hinman and Laurence S. Baskin. 2009. *Hinman's Atlas of Pediatric Urologic Surgery*. Saunders Elsevier



Figure 5. Autoaugmentation involves the excision of the detrusor muscle from the dome of the bladder allowing the epithelium to form a large diverticulum which may or may not be covered with a seromuscular gastric or sigmoid patch as a backing.
 Jr, Frank Hinman and Laurence S. Baskin. 2009. *Hinman's Atlas of Pediatric Urologic Surgery*. Saunders Elsevier

*Table 1. Advantages and Disadvantages of Procedures for Bladder Augmentation
 Editor in chief: Steven G Docimo. 2007. The Kelalis-King-Belman Textbook
 of Clinical Pediatric Urology Fifth Edition. Informa Healthcare*

Procedure	Advantages	Disadvantages
Intestinocystoplasty	Extremely compliant tissue Availability of tissue Proven long-term clinical efficacy	Heterotopic epithelium Mucus Infections Stones Hyperchloremic metabolic acidosis Malignant transformation Spontaneous rupture
Gastrocystoplasty	Moderately compliant tissue Easily definable submucosal plane for reimplantation Minimal mucus and stone formation Acid buffering in renal insufficiency patients	Hematuria dysuria Hyperchloremic hypokalemic metabolic alkalosis
Autoaugmentation	Preservation of native urothelium Avoid bowel Technically less demanding procedure Extraperitoneal procedure Does not preclude future conventional enterocystoplasty	Inability to predict success preoperatively

Beside its benefit to the patients, bladder augmentation can leave post operative problems, some problems that might occurred after bladder augmentation procedure are urethral leakage, mucus secretion, wound infection with abscess formation is more common after colonic than after ileal operations, bladder calculi and penile burning sensation with hematuria or dysuria from hyperacidic urine occurred in the majoritu of the children.

Bladder augmentation might have complications that occurred sooner or later, such complications that can occurred after bladder augmentation procedure are mucus production, urinary tract infection, calculi, metabolic complications, hyperchloremic metabolic acidosis, depletion of bony buffers and absorption of other solute, hypokalemic anh

hypochloremic, aciduria and hematuria-dysuria syndrome, composite reservoir, spontaneous bladder perforation, malignancy and problems with pregnancy. Therefore evaluation are needed for patients who underwent bladder augmentation surgery, in summary complication and its corrective options can be seen in tabel 2.

Table 2. Complications with Corrective Options

Location	Complication	Corrective Options
URETER	Stricture or loss	Ureteroureterostomy, Mobilization of kidney, Psoas hits; bladder flap, Ileal ureter, Autotransplant
	Dilatation	Tailoring
URETEROVESICAL JUNCTION	Stricture Reflux	Reimplantation Reimplantation, Ileal nipple, Others
DETRUSOR MUSCLE	Reduce compliance	Pharmacologic agents, Neural manipulation, Hydrodistention, Augmentation, Vesicostomy
	Increased compliance	Intermittent catheterization
OUTLET	Contracture incompetence	Dilatation Vesical neck repair, Sling with intermittent catheterization, Artificial sphincter, Closure of neck
	Dyssynergia	Sphincterotomy, Intermittent catheterization

Jr, Frank Hinman and Laurence S. Baskin. 2009. Hinman's Atlas of Pediatric Urologic Surgery. Saunders Elsevier

Literature Review on Bladder Augmentation taken from four journals will be described as an option for which is the best technique to use and also its efficacy. First journal entitled Bladder

Augmentation: Review Of The Literature And Recent Advances, reviewed that Gastrointestinal tissue used for enterocystoplasty is associated with different short and long-term complications. Reservoir perforation must be considered in patients with acute abdominal pain or peritonitis and long-term follow-up of renal function is needed. In addition, one has to be aware of the long-term risk of malignancy

in these procedures which has come to the attention of the urologists recently. Regarding these complications, there is a current necessity to develop alternative tissues for bladder augmentation by the help of tissue engineering protocols that will replace the integration of bowel segments into the urinary tract. Until then, intestinal cystoplasty still seems to be the gold standard due to the lack of promising alternative options (Gurocak, S, et.al, 2007). *Gurocak, S. et al. 2007. Bladder augmentation: Review of the literature and recent advances. Indian J Urol. 2007 Oct-Dec; 23(4): 452–457. doi: 10.4103/0970-1591.36721*

Complications After Bladder Augmentation Or Substitution In Children: A Prospective Study Of 86 Patients by (Kispal, Z. et al. 2010), reported, urinary bladder augmentation or substitution is associated with a large number of complications, particularly after colocolocystoplasty. Careful patient selection, adequate preoperative information and life-long follow-up are essential for reduction, early detection and management of surgical and metabolic complications in patients with bladder augmentation or substitution. *Kispal, Z., et al. 2010. Complications After Bladder Augmentation Or Substitution In Children: A Prospective Study Of 86 Patients. B J U I N T E R N A T I O N A L | 1 0 8 , 2 8 2 – 2 8 9 | doi:10.1111/j.1464-410X.2010.09862.x*

Çetinel, B, et.al, in 2016 with their study entitled of Augmentation Cystoplasty In Neurogenic Bladder, reported that the most widely used bowel segment for AC is a detubularised patch of ileum. Although many complications such as metabolic disorders, perforation, increased risk of malignancy, and urinary stone formation could be seen after AC, all series of patients undergoing AC for neurogenic bladder reported an improvement in bladder capacity. Several adjunctive surgical treatment alternatives are available to treat coexisting SUI. Augmentation with stoma using Mitrofanoff or Monti channel may be required in patients who are not able to perform transurethral CIC. To avoid these complications new therapeutic alternatives such as tissue engineering approaches are needed. Although at present bladder tissue engineering is far away from achieving normal storage and emptying functions of micturition, it might become a reality in the future. *Çetinel, B, et al. 2016. Augmentation cystoplasty in neurogenic bladder. Investig Clin Urol. 2016 Sep; 57(5): 316–323. Published online 2016 Aug 31. doi:10.4111/icu.2016.57.5.316*

Robot-assisted Laparoscopic Augmentation Ileocystoplasty and Mitrofanoff Appendicovesicostomy in Children: Updated Interim Results

reported by Murthy, P. et al, in 2015, revealed, Robot-assisted laparoscopic augmentation ileocystoplasty with Mitrofanoff appendicovesicostomy (RALIMA) may protect the upper urinary tract and reestablish continence in patients with refractory neurogenic bladder. Robotic assistance can provide the benefits of minimally invasive surgery without the steep learning curve of pure laparoscopy. RALI appears to offer functional outcomes similar to OAI. Although it is a significantly longer procedure, it may decrease LOS and avoid epidural use. Further refinements may reduce operative time. Murthy, P., et al. 2015. *Robot-assisted Laparoscopic Augmentation Ileocystoplasty and Mitrofanoff Appendicovesicostomy in Children: Updated Interim Results. Uropean Urology. European Urology. Volume 68 Issue 6, December 2015, Pages 1069-1075*

As conclusions, bladder augmentation is increasing the size of the bladder, usually with a patch of bowel. This allows patients to store usually a lot of urine in their bladder. It is usually used for patients that have neurologic injury or disease that has caused the bladder to shrink and frequently spasm leading to leakage of urine.

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