Orthotopic bladder substitution after radical cystectomy for invasive bladder cancer (T1GIII), offers the patient a cosmetic result and the ability to void per the urethra compared to ileal conduit or other continent diversions. The positive influence of this treatment on a patient’s quality of life has been documented (Hobisch et al., 2000; Yoneda, Igawa, Shiina, Shigeno, & Urakami, 2003). Strict patient selection criteria and the use of a standardized surgical technique have been reported as important factors predisposing to successful outcome (Studer, Burkhard, Danuser, & Thalmann, 1999). The patient must be willing to comply with a regular lifelong followup; an unwilling or hesitating patient should be offered an alternative mode of urinary diversion. The preoperative evaluation of a candidate for an orthotopic bladder substitution includes exclusion of any metastatic disease and any major liver or renal insufficiency. History of bowel disease or pelvic irradiation is not a prime contraindication for orthotopic bladder substitution, but may affect the outcome of the procedure.

Surgery aims to eradicate malignancy and this is achieved by a meticulous iliac lymphadenectomy and cystectomy. The preservation of pelvic autonomic nerves, the less-traumatic dissection of urethra, and the preservation of the sphincteric mechanism as well as maximum functional urethra length are important technical principles. These, together with a low-pressure spheroidal, orthotopic reservoir constructed from 40 to 44 cm length of terminal ileum will result in satisfactory upper-urinary tract protection and voiding function (Doherty, Burkhard, Hollinger, & Studer, 2001; Turner, Danuser, Moehrle, & Studer, 1997).

Immediate postoperative care, patient rehabilitation, and lifelong followup are necessary for good long-term results. The postoperative management is divided for descriptive reasons into three time periods that correspond to certain landmarks achieved. These periods, which are interrelated and should be considered as a continuum in a patient’s postoperative care, are presented.

Early Postoperative Care (Days 1-10)

The patients must be admitted to an intermediate care unit for the first 24 to 48 hours following surgery. Strict fluid balance with daily weights is necessary, and daily blood tests should be performed to monitor the electrolytes, hemoglobin, and bicarbonate levels. Generally all patients have a gastrostomy, an 18Fr urethral catheter, suprapubic bladder drainage, two wound drains, and two simple ureteric 8Fr stents, which are exteriorized to the abdomen through the bladder substitute to minimize urine contact with the neobladder mucosa and absorption of urine contents.
Gentle manual irrigation and vigorous aspiration of the bladder substitute are commenced on the operative day in the intermediate care unit through the suprapubic catheter with 50 ml of saline 0.9% every 6 hours while the suprapubic tube is freely drained. The irrigation is mandatory to prevent any mucus clot catheter blockage, which may lead to reservoir distention and leakage.

Patients are encouraged to mobilize on the first postoperative day and undergo further regular physiotherapy by physical therapists to avoid deep vein thrombosis and pulmonary complications. Bowel function return is accelerated with subcutaneous neostigmine methyl sulfate commenced on the 3rd postoperative day, with a starting dose of 0.5 mg TID that may be increased thereafter. The gastrostomy is removed after bowel function returns, usually on the 3rd to 4th postoperative day when the patient starts to eat gradually. The ureteric stents are removed about 1 week after surgery. Wound drains are removed when the output is less than 50 ml/day.

Late Postoperative Care (Days 10-30)

The integrity of the bladder substitute is examined with a cystogram performed 10 days after surgery. If urinary extravasation is not observed, the suprapubic drain is removed first to allow healing of the reservoir wall at the site of puncture, followed 2 days later by removal of the urethral catheter. In the presence of urine extravasation the tubes are left in place until the anastomosis, checked by a repeated cystogram, is dry. Any bacteriuria or urinary tract infection must be treated, especially in the early learning phase of voiding where the presence of post-void residual urine would favor urinary tract colonization or infection; quinolones are suggested for treatment and prophylaxis.

Voiding training. A specialist nurse teaches the technique of voiding during the hospitalization. The patients are advised to expect continence recovery about 3 months for daytime, and after 9 months for nighttime; this process requires their active participation. Patients are instructed to void in a sitting position every 2 hours during the day and every 3 hours at night. The nurse should explain that because there is no longer any neurologic feedback between reservoir and brain, they must not expect a normal desire to void. It is suggested that the patient set two alarm clocks at nighttime for less sleep interruption. Patients must be taught that the technique of voiding is mastered gradually. Voiding occurs by relaxation of the pelvic floor, followed by slight abdominal straining possibly aided by hand pressure on the lower abdomen and bending forward. Effectiveness of reservoir emptying is monitored with self-catheterization, performed once every night. When the patient remains continent for the allocated time period and if not acidotic, determined by normal serum bicarbonate levels, the voiding interval gradually increases by half-hour increments until continence is maintained for 4 hours. The patient is advised not to void prior to the allotted time period even if dribbling appears, in order to achieve a gradual distention of the reservoir resulting in a low-pressure continent system.

The goal of orthotopic bladder substitution is to create a reservoir for urine with a capacity of about 500 ml. The functional outcome of orthotopic bladder substitutes depends on surgical technique used, patient’s age, and compliance with voiding instructions (Madersbacher, Mohrle, Burkhard, & Studer, 2002). In this process, pelvic muscle rehabilitation with Kegel exercises is of utmost importance (Kolkaba, Dowd, Winslow, & Jacobson, 2000; Moul, 1998).

Sphincter training is taught by performing a digital rectal examination, and requesting the contraction of the anal sphincter only. Then, the patient is advised to perform this exercise 10 times per hour, maintaining contraction for 6 seconds until continence is achieved. Men are also advised to milk the urethra empty at the end of a void to prevent dribble incontinence after micturition (Barber, Hugonnet, Burkhard, & Studer, 2001). A summary of voiding rehabilitation is shown in Table 1.

Metabolic management. Following catheter removal, the patient is at increased risk of a metabolic acidosis, particularly in the presence of residual urine or infection. This occurs due to the reabsorption of ionized

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphincter strengthening</td>
<td>Kegel exercises (10 times/hour)</td>
</tr>
<tr>
<td>Voiding process</td>
<td>Pelvic floor relax, abdominal straining, Credé maneuver, bending forwards</td>
</tr>
<tr>
<td>Improve continence</td>
<td>Emptying every 2 hours at day and every 3 hours at night (alarm clocks)</td>
</tr>
<tr>
<td>Increase reservoir capacity</td>
<td>Emptying in allotted time even if dribbles</td>
</tr>
<tr>
<td>Avoid post voiding dribbling</td>
<td>Milking of urethra empty</td>
</tr>
</tbody>
</table>

Table 1. Voiding Rehabilitation of Patients with Orthotopic Bladder Substitutes
ammonium and chloride from the urine. Ammonium will substitute for sodium-hydrogen in the reservoir wall, with the ammonium acting as a competitive inhibitor of sodium (Stampfer & McDougal, 1997). As metabolic acidosis is the most common biochemical abnormality in patients with orthotopic reservoirs, physicians and patients must be aware of its symptoms (see Table 2). Patients complaining of gradually increasing lethargy, vomiting, nausea, and anorexia with epigastric burning must be admitted to the hospital for evaluation. Diagnosis is confirmed with venous blood gas analysis. The negative base excess must be immediately corrected with sodium bicarbonate 2 to 6 g/day. Practically all patients need a short-term treatment for metabolic acidosis with 4 g/day sodium bicarbonate orally given during the first 3-months postoperatively, and thereafter until the reservoir mucosa becomes more resilient to electrolyte and fluid exchange.

After the removal of the indwelling catheter, hypo-osmolar urine is at prolonged contact with the mucosa of the bladder substitute. The ileum segment reaches equilibrium by shifting salt into the reservoir and simultaneously absorbing acid in the form of ammonium into the bloodstream. Under these circumstances, the patient is at increased risk of a hypovolemic salt-losing situation eventually resulting in a hypochloremic, hyperkalemic metabolic acidosis (Mills & Studer, 1999). These patients lose body weight rapidly because of dehydration and anorexia. Thus, daily body weight monitoring is mandatory postoperatively. Patients must be advised to consume 2 to 3 liters of water or natural juices per day and to increase the salt intake in their diet to replace any salt loss. A synopsis of the metabolic disorders as well as a therapeutic algorithm is proposed in Table 3.

**Long-Term Followup**

Meticulous lifelong followup is essential for oncological and functional reasons as well as prevention of long-term complications. A suggested followup schema is shown in Table 4. Imaging procedures are essential for tumor recurrence exclusion and residual urine detection in the long term, since self-catheterization is not performed until the 30th postoperative day. Urine cultures for exclusion of infections and blood tests for hematological and biochemical status and metabolic balance are also very important. In the long term, a successful bladder substitute has no infection, no incontinence, no acidosis, and no significant post-void residual urine.

**Management of Complications**

The ileal bladder substitutes are not normally colonized with bacteria like an ileal conduit,

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**Table 2. Symptoms of Metabolic Acidosis**

- Fatigue, weakness, and lethargy
- Anorexia
- Nausea and vomiting
- Epigastric burning and heartburn
- Weight loss

**Table 3. Metabolic Disorders and Essential Management**

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt loss</td>
<td>NaCL 0.9% solutions, management of metabolic acidosis</td>
</tr>
<tr>
<td>Acute metabolic acidosis</td>
<td>Indwelling catheter, treat any urinary infection, correct base excess with NaHCO₃</td>
</tr>
<tr>
<td>Chronic metabolic acidosis</td>
<td>Body weight check, 2-3 liters of fluids per day, increase salt intake, 2-6 gm/day of NaHCO₃, stop H2-blockers, frequent venous blood gas check</td>
</tr>
</tbody>
</table>

**Table 4. Suggested Long-Term Followup Protocol for Patients with Ileal Bladder Substitutes**

<table>
<thead>
<tr>
<th>Month after Surgery</th>
<th>3</th>
<th>6</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>30</th>
<th>36</th>
<th>42</th>
<th>48</th>
<th>54</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical examination, body weight, urine culture, blood tests, residual urine</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal ultrasound</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intravenous urography</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest x-ray, urethral lavage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bone scan, pelvic/ abdominal CT scan *</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tbody>
</table>

* If ≥ pT3 and each pN+
which communicates with the skin freely; so, any bacteriuria must be actively treated. Although urinary infection is an exception, it is diagnosed in about 12% of patients at each consultation (Studer & Zingg, 1997). Recurrences mostly indicate functional problems of the reservoir and must be managed by identifying the etiology of the infection.

Urinary retention is detected with suprapubic ultrasound or in-out (straight) catheterization in regular followup. It may be due to a protrusion of the reservoir mucosa into the urethra, a stricture at the neobladder neck, or a stricture in the urethra. Hernias of the abdominal wall also impair the ability to generate sufficient abdominal pressure resulting in insufficient reservoir emptying. All these complications should be aggressively treated to prevent a “floppy-bag,” large capacity reservoir.

The proposed long-term followup protocol allows for the close monitoring of disease recurrence in the upper tracts and urethra. An upper-tract recurrence is treated with a nephroureterectomy, while a urethral one is managed either conservatively with BCG instillations (Palou, Xavier, Laguna, Montlleo, & Vicente, 1996) or surgically with urethrectomy, followed by conversion of the reservoir to an ileal conduit.

Summary

The surgical technique to construct an orthotopic, continent bladder substitute may be partially responsible for good results. However, the collaboration between the physician, the nurse, and the patient is needed to ensure a successful adaptation to surgery and an uneventful postoperative recovery. Regular followup is important for a long-term satisfactory outcome.

References


