



Review Article

Mortality following augmentation cystoplasty: A transitional urologist's viewpoint

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Summary

Introduction

Three complications have been hypothesized to increase patient mortality following enterocystoplasty: spontaneous bladder perforation, bladder neoplasia, and chronic renal failure (CRF). The present study examined risk of their occurrence and discussed ways to improve the quality of care.

Materials and methods

The present transitional clinic followed 385 patients with a history of bladder augmentation using either ileal, sigmoid, or ascending colon. The median age was 37 years (range 16–71). Median follow-up interval after augmentation was 26 years (range 2–59).

Discussion

Spontaneous rupture of the bladder occurred in 3% (13/385), with one associated death (0.25%, 1/385). Spontaneous bladder rupture significantly correlated with substance abuse, non-compliance with catheterization, and mental/physical disabilities that required the use of surrogates to perform and monitor intermittent catheterization ($P < 0.01$).

Introduction

Goals of reconstructive surgery

The primary purpose of any reconstructive procedure is to provide the highest quality of life with the lowest potential for complications. Success is therefore measured by the operations ability to meet four primary objectives: preservation of life, preservation of renal function, creation or preservation of urinary continence, and creation or preservation of sexual function. One major caveat to consider in reaching these objectives is that at no time should one of the lesser goals trump those that go before it. This review was framed from the viewpoint of a transitional urologist, with its primary objective being to

Of the 203 patients that were followed for ≥ 10 years, 4% (8/203) developed a bladder tumor. In comparison, 2.5% (5/203) of an age-matched control population, managed by anticholinergics and intermittent catheterization, developed a bladder tumor. Therefore, enterocystoplasty cannot be associated with an increased risk of cancer development ($P = 0.397$).

Chronic renal failure \geq Stage 3 arose in 15% (58/385), and 1% (4/385) of the patients died as a result of this complication. Obese patients (BMI ≥ 30) catheterizing per urethra were more likely to be non-compliant with catheterization and develop CRF compared with obese patients with a continent catheterizable stoma ($P > 0.001$). These findings suggest that compliance with intermittent catheterization and renal preservation are enhanced by the presence of a catheterizable abdominal stoma.

Conclusion

The individual's intellectual and physical capability to obey medical directives, refrain from high-risk habits, maintain a healthy weight, and comply with long-term follow-up visits were all critical to the enduring success of bladder augmentation.

provide the pediatric urologist insight into the long-term success of enterocystoplasty in its ability to meet the first key objective: preservation of life.

Considerations when interpreting the data

The incidence of post-surgical complications following urologic reconstructive surgery varies from study to study. Variation is based on the length of follow-up, the type of augmentation performed, the use of concurrent bladder outlet obstructive procedures, the presence of continent abdominal stomas, and the patient's ability to comply with medical directives [1–6].

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In reviewing any data from a transitional urology clinic it is important to note that during the past three decades there has been a continual evolution in the management of infants and children with congenital urologic abnormalities. Notably, advances in neonatal and pediatric care have resulted in significantly more individuals who are born with a complex congenital anomaly to survive into adulthood [7,8]. In contrast, the use of dietary supplements such as folic acid and the utilization of therapeutic abortions for the treatment of fetuses with severe congenital anomalies have decreased the incidence of these defects [9]. Additionally, the proliferation of ongoing quality care projects that may favorably impact patient care may also have impacted the outcome data [2,10–13]. Indeed, the patients that are currently being seen in transitional clinics and reported on in this paper may not mirror those of future generations.

Bladder augmentation and complications that impact the preservation of life

Three long-term complications of bladder augmentation have been hypothesized or documented to be associated with the subsequent death of the patient: perforation of the bladder augment, development of bladder neoplasia, and the onset of end-stage renal disease (ESRD) [2,14,15].

Method

Study population

The transitional clinic followed 385 patients with a history of bladder augmentation using either ileal, sigmoid, or ascending colon. The median age of patients in this clinic was 37 years (range 16–71). The median age at the time of bladder augmentation was 11 years (range 2–16). Follow-up interval from the time of augment was defined as the number of years the enteric tract had been exposed to urine. In 26 patients, ileal conduits had initially been performed followed by urinary Undiversion, with the incorporation of the conduit into the augmented bladder. In this patient population, the follow-up interval began at the time of ileal conduit formation, not augmentation. Median follow-up interval after the enteric tract was exposed to urine was 26 years (range 2–59) [16,17]. The underlying reasons for a bladder augmentation were: neurogenic bladder in 62% (237/385), exstrophy–epispadias complex in 22% (85/385), PUV in 11% (42/385), and a variety of miscellaneous etiologies in 5% (21/385).

Spontaneous bladder perforation

A total of 3% (13/385) of patients developed a spontaneous rupture of the bladder, with one associated death (0.25%, 1/385). The majority of spontaneous bladder ruptures were directly related to either substance abuse or patient non-compliance with catheterization. Specifically, during a 25-year time span, 203/385 patients, aged 16–53 years, were screened for the presence of alcohol abuse and/or non-compliance with medical directives regarding CIC. Alcohol

abuse was defined per criteria outlined by the National Institute on Alcohol Abuse and Alcoholism [18]. Patients were considered to abuse alcohol if the individual: routinely had >14 drinks per week, and/or participated in binge drinking, defined as having >4–5 drinks over a 2-h period at least one day per month [18]. Failure to be compliant with CIC was defined as the patient admitting to catheterizing ≤ 3 times per day on a routine basis [2,19]. Median age of patients involved in the study was 24 years (range 16–53). Of these patients, 12% (24/203) admitted to a history of alcohol abuse, 17% (4/24) had a coexisting chemical dependency. An additional 6% (12/203) became non-compliant with catheterization, but did not give a history of substance abuse. Of the 36 patients with a history of substance abuse or non-compliance with medical directives, 22% (8/36) experienced spontaneous bladder rupture; 14 bladder ruptures and one death occurred within this patient population. Two of these patients, 0.5% (2/385) of the total patient population, were eventually converted to ileal conduits due to repeated bladder perforations ($n = 3$) and failure to gain sobriety. It is noteworthy that in patients with non-compliance with catheterization, a diagnosis of intellectual disability was present in 50% (6/12). In the 167 patients who were compliant with intermittent catheterization routines and did not have a history of substance abuse, 1% (2/167) had a spontaneous bladder rupture, and no deaths were reported ($P = 0.006$) [2,19].

The 12% incidence of alcohol abuse found in adults with an enterocystoplasty mirrored the rate found within the population of the United States, where 8–17% of individuals become alcohol or substance dependent; this incidence depends upon sex and age of the person [18–20]. The physiological effects and consequences of alcohol consumption following enterocystoplasty cannot be understated. The development of alcohol-induced diuresis, coexisting with impaired mental and physical abilities provoked by alcohol intoxication, provides the ‘perfect storm’ with which to induce a spontaneous bladder rupture.

It is also important to note the association of mental impairment/deficiency with the failure to be compliant with medical directives [2,19]. Specifically, the correlation between mental impairment and non-compliance with catheterization becomes manifest in the maturing patient, as they become less reliant on their parents, move into group homes and/or their elderly parents develop mental or physical disabilities. Indeed, due to the patient becoming either physically unable to perform catheterization ($n = 2$) or an inability to find surrogates to perform catheterization ($n = 8$), the institution managed 2.5% (10/385) of patients with a chronic, indwelling, 22–24F supra-pubic tube (SP). During a median follow-up interval of 7 years following placement of an SP tube (range 2–12), all 10 patients who were managed in this fashion developed complications (Table 1). To prevent mucous plugging of the catheter and stone formation, it was attempted to manage these patients with daily bladder irrigations with >240 ml fluid daily. Unfortunately, a surrogate was often unable to be found to perform this, and non-compliance with this directive was universal. Eventually, due to multiple urologic complications, 20% (2/10) of patients managed with a suprapubic tube, or 0.5% (2/385) of the entire cohort

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