Population Based Assessment of Enterocystoplasty Complications in Adults

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Abbreviations and Acronyms

ESRD = end stage renal disease

SES = socioeconomic status

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For another article on a related topic see page 653.

Editor's Note: This article is the third of 5 published in this issue for which category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 680 and 681.

Purpose: Enterocystoplasty can be used to treat several types of bladder dysfunction. We conducted a population based study to identify the rate and significant predictors of urological surgery after adult enterocystoplasty.

Materials and Methods: A retrospective, population based cohort was assembled using administrative data records, and adults who underwent enterocystoplasty between 1993 and 2009 were included in the analysis. Administrative data sources were used to measure primary exposure (neurogenic bladder and concurrent catheterizable channel or anti-incontinence procedure) and primary outcome (urological surgical procedures after enterocystoplasty). Multivariable Cox proportional hazards models were used (covariates of age, gender, Charlson score and socioeconomic status).

Results: We identified 243 patients, of whom 61% had a neurogenic bladder, 20% had a simultaneous incontinence procedure and 18% underwent creation of a catheterizable channel. Median followup was 7.8 years (IQR 4.0–12.2). The proportion of patients who required a subsequent urological procedure was 40% (0.098 procedures per person-year of followup). A simultaneous incontinence procedure at enterocystoplasty was a significant predictor of future surgical procedures (HR 1.47, 95% CI 1.02–2.12, p = 0.0414). Cystolitholapaxy was the most common subsequent procedure (25% of patients) and a catheterizable channel conferred a significant risk of cystolitholapaxy (HR 2.92, 95% CI 1.461–5.85, p = 0.0024).

Conclusions: Repeat urological surgery is common after enterocystoplasty. Patients who require a simultaneous incontinence procedure at enterocystoplasty are more likely to require future surgery. Patients with catheterizable channels are at significant risk for future cystolitholapaxy.

Key Words: postoperative complications; urinary bladder, neurogenic

ENTEROCYSTOPLASTY has been used to treat bladder dysfunction for more than 100 years and much of our knowledge of the complications comes from pediatric myelomeningocele cases.[1,2] However, enterocystoplasty is also used in the adult population for neurogenic bladder dysfunction, as well as for overactive bladder, inflammatory conditions that result in a severely contracted bladder, interstitial cystitis, and reconstruction of iatrogenic bladder damage as a result of treatment of bowel and gynecological malignancies.[3]

Enterocystoplasty is a procedure with long-term durability and high rates of patient satisfaction.[4,5] New therapies such as sacral neuromodulation and intradetrusor botulinum toxin have been used in some patients who would previously have required

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enterocystoplasty.[6] However, it is important to understand the rate of post-enterocystoplasty complications to compare enterocystoplasty to new therapies. Limitations of previous case series include a mix of adult and pediatric patients, results of a single highly specialized surgeon, no time to event analysis, and no adjustment for the etiology of the bladder dysfunction and associated procedures. We conducted a population based, retrospective cohort study of enterocystoplasty cases (not including urinary diversion) to identify potential differences in the rates of urological surgical procedures between neurogenic and nonneurogenic cases, and those with and without catheterizable channels or bladder neck procedures.

METHODS

Study Population

Study subjects were obtained using CIHI-DAD (Canadian Institutes for Health Information Discharge Abstract Database) and OHIP (Ontario Health Insurance Plan) records between January 1, 1993 and December 31, 2009. The primary inclusion criterion was identification of an OHIP claim for enterocystoplasty with a concurrent CIHI-DAD hospital admission with a procedure code consistent with enterocystoplasty. Patients were excluded from study if they were younger than age 18 years at surgery (which OHIP codes cannot reliably capture). Data were collected from the Province of Ontario, Canada, which has a population of more than 13 million, and a universally accessible, publicly funded health care system. Ethics approval was obtained from our institution.

Outcomes

The primary outcome measure was urological surgical procedures after enterocystoplasty. This included procedures for the treatment of upper and lower tract calculi, the requirement for post-enterocystoplasty urinary diversion, bladder rupture repair and surgical incontinence treatment. Secondary outcomes were ESRD requiring dialysis or renal transplantation, and bladder cancer. We used OHIP records from January 1, 1993 to December 31, 2010 to identify surgical procedures and billing codes related to ESRD. The OCR (Ontario Cancer Registry) records were used to assess the bladder cancer after enterocystoplasty.

Exposures

To assess the impact of the underlying diagnosis on outcomes we divided patients into 2 groups (using ICD codes associated with enterocystoplasty admission) based on the presence or absence of an associated neurological disease. Neurogenic bladder included multiple sclerosis, congenital anomalies (including myelomeningocele) and spinal cord injury. Nonneurogenic bladder included urinary dysfunction, pelvic cancer treatment morbidity or interstitial cystitis.

To assess the impact of associated procedures at the time of enterocystoplasty we used OHIP codes to identify patients who underwent an incontinence procedure or the creation of a catheterizable channel at enterocystoplasty. Covariates were age, gender, the Charlson-Deyo comorbidity index[7] and SES (derived from median neighborhood income and reported in quintile ranks from 1—lowest SES to 5—highest SES).

Data Sources and Validity

Hospitals in Canada are required to submit a report of all admissions to the CIHI-DAD. Trained abstractors code diagnoses, comorbidities and procedures. CIHI-DAD data quality is assured through variable verification and audit-feedback. Re-abstraction studies have shown greater than 80% agreement with coding elements.[8] The OHIP database contains all physician fee-for-service claims and surgical claims have good agreement with other sources of procedural data.[8] The OCR uses administrative data to capture the diagnosis of all malignant neoplasms in Ontario.[9]

Data Analysis

Continuous and ordinal data are presented as median (IQR). Categorical data are presented as proportion and percentage. Privacy regulations do not allow the reporting of any groups of fewer than 6 people and any such instances were reported as n <6*. We used Kaplan-Meier survival analysis to calculate outcome rates. Patients were censored at the date of urinary diversion or cystectomy (in the event of enterocystoplasty failure), last clinical contact with any physician or death. Patients were considered at risk for an event from the time of enterocystoplasty to the time of censoring. The frequency of an outcome represents the number of patients who experienced that outcome. The rate of a postoperative outcome is reported as per person-year of followup.

A multivariable Cox proportional hazard model was used to evaluate the primary outcome of post-enterocystoplasty urological surgical procedures. Patients were considered for study if they had one of the defined procedures during followup. Control patients had none of the defined procedures during followup. This was a repeated events model (allowing patients to experience multiple outcomes) with robust standard errors to account for dependence.[10] Hazard ratios (with 95% CI and p values) were reported with $p < 0.05$ considered significant. SAS® 9.2 was used for statistical analysis.

RESULTS

We identified 243 patients (median age 40 years, IQR 27–52) who met our study criteria. A total of 78 urologists performed a median of 1 enterocystoplasty (IQR 1–2) and 52% of cases were by surgeons performing more than 10 procedures during the study period. The overall median length of hospital stay after enterocystoplasty was 10 days (IQR 8–15). The 90-day all cause mortality after enterocystoplasty was low (n <6*). The overall median followup of our cohort was 7.8 years (IQR 4.0–12.2). The rate of enterocystoplasty decreased significantly with time ($p = 0.0048$, see figure).