**Original Research**

**Manuscript submitted to BMC Urology**

**Title**

**Mid- to long-term outcomes and healthcare burden following open Cohen versus Lich‒Gregoir ureteral reimplantation for pediatric unilateral dilating vesicoureteral reflux: A multicenter propensity score-matched study**

**Supplementary materials**

**Table of contents**

[**Supplemental Table S1** 2](#_Toc202871259)

[**Supplemental Table S2** 3](#_Toc202871260)

[**Supplemental Table S3** 4](#_Toc202871261)

[**Supplemental Table S4** 5](#_Toc202871262)

[**Continued Supplemental Table S4** 6](#_Toc202871263)

[**Continued Supplemental Table S4** 7](#_Toc202871264)

[**Supplemental Table S5** 8](#_Toc202871265)

[**Supplemental Table S6** 9](#_Toc202871266)

[**Supplemental Table S7** 10](#_Toc202871267)

[**Continued Supplemental Table S7** 11](#_Toc202871268)

**Supplemental Table S1** Complication definitions applied in the current study

|  |  |
| --- | --- |
| Complication | Definition |
| Bladder-related complications |  |
| Acute urinary retention | Sudden inability to urinate requiring catheterization or other medical interventions. |
| Voiding dysfunction | Difficulty or inability to empty the bladder effectively, such as straining, weak stream, or incomplete emptying. |
| Urinary leakage | Involuntary leakage of urine not related to nocturnal enuresis. |
| Ureteral- related complications |  |
| Acute ureteral obstruction | Sudden blockage of urine flow through the ureter requiring immediate medical or surgical intervention. |
| Ureteral injury | Damage to the ureter occurring during or immediately after surgery that necessitates intervention. |
| Ureteral stenosis | Narrowing of the ureter developing over time postoperatively, obstructing urine flow and potentially requiring surgical correction. |
| Incisional-related complications |  |
| Bleeding or bruising at the surgical site | Assessed through clinical observation. |
| Infection of the incision | Characterized by redness, swelling, warmth, and purulent discharge, confirmed by clinical evaluation and microbiological testing. |
| Incisional hernia | Development of a hernia at the surgical site occurring weeks to months postoperatively, identified through physical examination or imaging studies. |
| Undefined-location related complications |  |
| Short-term restricted bowel activity | Temporary cessation of normal bowel activity, resulting in abdominal distention, nausea, vomiting, and the absence of bowel movements or gas, typically identified through clinical evaluation and imaging. |
| Anastomotic stricture | Formation of a narrowing at the site of the ureteral anastomosis occurring weeks to months postoperatively, leading to symptoms such as urinary obstruction or difficulties, confirmed through clinical assessment and imaging studies. |

**Supplemental Table S2** Characteristics of children and surgeon according to VUR treatment groups before and after propensity score matching

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Covariates | Treatment groups | Before matching, n (%) | | | |  | After matching, n (%) | | | |
|  |  | Cohen (N=198) | LG (N=215) | P value | SMD |  | Cohen (N=127) | LG (N=127) | P value | SMD |
| Age at surgery, years | Median (IQR) | 8 (4.25-9) | 8 (6-9) | **0.004** | 0.282 |  | 8 (6-9) | 7 (6-9) | 0.677 | 0.052 |
| Gender | Male | 108 (54.5) | 128 (59.5) | 0.355 | 0.101 |  | 69 (54.3) | 72 (56.7) | 0.801 | 0.048 |
|  | Female | 90 (45.5) | 87 (40.5) |  |  |  | 58 (45.7) | 55 (43.3) |  |  |
| BMI, kg/m2 | Median (IQR) | 15.1 (13.5-20.8) | 13.9 (13.6-15) | **<0.001** | 0.642 |  | 14.1 (13.4-18.7) | 14.1 (13.6-15.4) | 0.197 | 0.162 |
| Prior injection | Yes | 19 (9.6) | 25 (11.6) | 0.611 | 0.066 |  | 16 (12.6) | 16 (12.6) | 1 | <0.001 |
| Indications for surgery | Repeated breakthrough UTI | 94 (47.5) | 121 (56.3) | **0.002** | 0.531 |  | 61 (48.0) | 58 (45.7) | 0.925 | 0.175 |
|  | Symptomatic high-grade reflux (III-V) | 58 (29.3) | 75 (34.9) |  |  |  | 51 (40.2) | 54 (42.5) |  |  |
|  | Poor compliance to medical treatment | 10 (5.1) | 9 (4.2) |  |  |  | 7 (5.5) | 7 (5.5) |  |  |
|  | Ineffective or poorly tolerated CAP | 11 (5.6) | 2 (0.9) |  |  |  | 1 (0.8) | 2 (1.6) |  |  |
|  | Reflux nephropathy | 6 (3.0) | 5 (2.3) |  |  |  | 5 (3.9) | 4 (3.1) |  |  |
|  | Persistent reflux >2 years | 9 (4.5) | 0 (0.0) |  |  |  | 0 (0.0) | 0 (0.0) |  |  |
|  | Worsening in renal function | 4 (2.0) | 2 (0.9) |  |  |  | 2 (1.6) | 1 (0.8) |  |  |
|  | Presence of new renal scars on DMSA | 4 (2.0) | 0 (0.0) |  |  |  | 0 (0.0) | 0 (0.0) |  |  |
|  | Girls with persistent VUR after puberty | 0 (0.0) | 1 (0.5) |  |  |  | 0 (0.0) | 1 (0.8) |  |  |
|  | VUR recurrence after injection | 1 (0.5) | 0 (0.0) |  |  |  | 0 (0.0) | 0 (0.0) |  |  |
|  | Parental preference | 1 (0.5) | 0 (0.0) |  |  |  | 0 (0.0) | 0 (0.0) |  |  |
| VUR grade | III | 11 (5.6) | 9 (4.2) | 0.184 | 0.182 |  | 9 (7.1) | 7 (5.5) | 0.323 | 0.189 |
|  | IV | 52 (26.3) | 74 (34.4) |  |  |  | 35 (27.6) | 46 (36.2) |  |  |
|  | V | 135 (68.2) | 132 (61.4) |  |  |  | 83 (65.4) | 74 (58.3) |  |  |
| VUR laterality | Left | 80 (40.4) | 82 (38.1) | 0.711 | 0.046 |  | 49 (38.6) | 48 (37.8) | 1 | 0.016 |
|  | Right | 118 (59.6) | 133 (61.9) |  |  |  | 78 (61.4) | 79 (62.2) |  |  |
| Ureteral dilation | < 7 mm | 32 (16.2) | 65 (30.2) | **0.001** | 0.338 |  | 27 (21.3) | 40 (31.5) | 0.088 | 0.234 |
|  | ≥ 7mm | 166 (83.8) | 150 (69.8) |  |  |  | 100 (78.7) | 87 (68.5) |  |  |
| VUR phase on VCUG | At voiding | 113 (57.1) | 114 (53.0) | **<0.001** | 1.046 |  | 88 (69.3) | 93 (73.2) | 0.397 | 0.171 |
|  | At filling | 1 (0.5) | 68 (31.6) |  |  |  | 1 (0.8) | 3 (2.4) |  |  |
|  | At filling and voiding | 84 (42.4) | 33 (15.3) |  |  |  | 38 (29.9) | 31 (24.4) |  |  |
| Type of preop-UTIs | Afebrile | 7 (3.5) | 1 (0.5) | 0.057 | 0.221 |  | 2 (1.6) | 1 (0.8) | 1 | 0.073 |
|  | Febrile | 191 (96.5) | 214 (99.5) |  |  |  | 125 (98.4) | 126 (99.2) |  |  |
| Nb of preop-UTIs | 1 | 16 (8.1) | 8 (3.7) | **<0.001** | 0.523 |  | 7 (5.5) | 6 (4.7) | 0.565 | 0.134 |
|  | 2 | 67 (33.8) | 33 (15.3) |  |  |  | 39 (30.7) | 32 (25.2) |  |  |
|  | ≥ 3 | 115 (58.1) | 174 (80.9) |  |  |  | 81 (63.8) | 89 (70.1) |  |  |
| Preop-APN (DMSA) | Yes | 68 (34.3) | 20 (9.3) | **<0.001** | 0.636 |  | 30 (23.6) | 20 (15.7) | 0.156 | 0.199 |
| Preop renal scarring | No scarring | 104 (52.5) | 171 (79.5) | **<0.001** | 0.595 |  | 85 (66.9) | 92 (72.4) | 0.413 | 0.12 |
|  | Any scarring | 94 (47.5) | 44 (20.5) |  |  |  | 42 (33.1) | 35 (27.6) |  |  |
| Surgeon experience | <50 | 45 (22.7) | 9 (4.2) | **<0.001** | 0.818 |  | 17 (13.4) | 9 (7.1) | 0.254 | 0.209 |
|  | 50 - 100 | 138 (69.7) | 136 (63.3) |  |  |  | 97 (76.4) | 104 (81.9) |  |  |
|  | ≥ 100 | 15 (7.6) | 70 (32.6) |  |  |  | 13 (10.2) | 14 (11.0) |  |  |

**Supplemental Table S3** Rosenbaum’s primal sensitivity analysis for postoperative outcomes in the matched cohort

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes | Γ=1 | (Γ maxa, P valueb) | Real treatment effect |
| Postoperative symptomatic UTIs | 0.329 | (1,0.329) | Not significant even when there is no hidden bias (Γ=1), and it remains not significant even under the assumption of large hidden bias (Γ=15) |
| Acute urinary retention | 0.237 | (1,0.237) | Not significant |
| Voiding dysfunction | 0.274 | (1,0.274) | Not significant |
| Urinary leakage | 0.125 | (1,0.125) | Not significant |
| Ureteral stenosis | 0.133 | (1,0.133) | Not significant |
| Incision bleeding/bruising | 0.189 | (1,0.189) | Not significant |
| Incisional hernia | 0.250 | (1,0.250) | Not significant |
| Anastomotic stricture | 0.125 | (1, 0.125) | Not significant |
| Acute ureteral obstruction | **<0.001** | (3, 0.017) | **Significant when there is no hidden bias (Γ=1), and it remains significant as long as the level of hidden bias (Γ) is below 3 (even with 3 times the odds of differential treatment)** |
| Ureteral injury | **0.031** | (1, 0.031) | **Significant** |
| Infection of the incision | **0.044** | (1, 0.044) | **Significant** |
| Short-term restricted bowel activity | **0.004** | (1, 0.004) | **Significant** |
| Contralateral reflux | **0.016** | (1, 0.016) | **Significant** |
| 30-day GU readmissions | **<0.001** | (3, 0.012) | **Significant** |
| 90-day GU readmissions | **<0.001** | (1, <0.001) | **Significant** |
| 30-day GU ER visits | **<0.001** | (7, 0.040) | **Significant** |
| 90-day GU ER visits | **<0.001** | (3, 0.005) | **Significant** |
| 365-day additional VUR procedures | 0.377 | (1, 0.377) | Not significant |

The Gamma value Γ is a measure of sensitivity to hidden bias, in other words it is the magnitude that could alter the conclusion of the observational study due to hidden bias. aΓ max, Gamma max refers to the highest value of Gamma where the p-value remains below 0.05; bP value corresponds to the upper bound.

**Supplemental Table S4** Univariable and multivariable analyses of postoperative outcomes in the matched cohort

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Outcomes | Treatment technique:  Lich-Gregoir/Cohen |  |  |  |  |  | Ureteral stenting:  Yes/no |  |  |  |  |
|  | Univariable analysis |  |  | Multivariable analysis |  |  | Univariable analysis |  |  | Multivariable analysis |  |
|  | OR (95% CI) | P value |  | aOR (95% CI) | P value |  | OR (95% CI) | P value |  | aOR (95% CI) | P value |
| Postoperative symptomatic UTIs | 0.77 (0.61 - 0.96) | **0.022** |  | 0.73 (0.53 - 1.01) | 0.059 |  | 0.65 (0.22 - 1.91) | 0.436 |  | 0.50 (0.13 - 1.88) | 0.306 |
| Acute urinary retention | 1.21 (0.8 - 1.84) | 0.372 |  | 1.07 (0.34 - 3.36) | 0.906 |  | 0.35 (0.14 - 0.91) | **0.030** |  | 0.48 (0.12 - 2) | 0.313 |
| Voiding dysfunction | 0.81 (0.37 - 1.76) | 0.597 |  | 0.61 (0.2 - 1.86) | 0.390 |  | 1.16 (0.42 - 3.21) | 0.777 |  | 0.11 (0.01 - 1.39) | 0.089 |
| Urinary leakage | 1.75 (1.28 - 2.4) | **<0.001** |  | 94M (0.7M - 12900M) | **<0.001** |  | 0.46 (0.06 - 3.52) | 0.458 |  | 0.04 (0.01 - 0.11) | **<0.001** |
| Acute ureteral obstruction | 9.39 (6.47 - 13.64) | **<0.001** |  | 38.84 (15.44 - 97.71) | **<0.001** |  | 0.37 (0.13 - 1.06) | 0.065 |  | 0.64 (0.22 - 1.9) | 0.424 |
| Ureteral injury | 0.33 (0.19 - 0.57) | **<0.001** |  | 0 (0 - 0) | 0 |  | 19.1 (8.23 - 44.25) | **<0.001** |  | Inf (Inf - Inf) | 0 |
| Ureteral stenosis | 1.82 (0.86 - 3.86) | 0.119 |  | 2.49 (1.04 - 5.94) | **0.040** |  | 0.39 (0.14 - 1.1) | 0.076 |  | 0.83 (0.3 - 2.3) | 0.717 |
| Incision bleeding/bruising | 1.26 (0.95 - 1.67) | 0.115 |  | 0.78 (0.52 - 1.18) | 0.238 |  | 0.46 (0.15 - 1.41) | 0.175 |  | 0.56 (0.2 - 1.55) | 0.264 |
| Infection of the incision | 0.45 (0.25 - 0.79) | **0.006** |  | 0.61 (0.29 - 1.26) | 0.179 |  | 0.24 (0.12 - 0.48) | **<0.001** |  | 0.19 (0.08 - 0.44) | **<0.001** |
| Incisional hernia | 1.07 (0.04 - 28.79) | 0.967 |  | 1.57 (1.25 – 1.96) | **<0.001** |  | - | **-** |  | - | **-** |
| Short-term restricted bowel activity | 0.15 (0.06 - 0.36) | **<0.001** |  | 0.48 (0.36 - 0.63) | **<0.001** |  | 0.08 (0.01 - 0.45) | **0.004** |  | 0.13 (0.08 - 0.20) | **<0.001** |
| Anastomotic stricture | 0.60 (0.39 - 0.91) | **0.015** |  | 0.34 (0.08 – 1.46) | 0.147 |  | - | **-** |  | - | **-** |
| Contralateral reflux | 0.24 (0.14 - 0.39) | **<0.001** |  | 0.03 (0.03 - 0.04) | **<0.001** |  | 0.30 (0.04 - 2.09) | 0.226 |  | 0.96 (0.87 - 1.06) | 0.468 |
| 30-day GU readmissions | 0.06 (0.01 - 0.36) | **0.002** |  | 0.14 (0.06 - 0.34) | **<0.001** |  | 0.83 (0.55 - 1.25) | 0.374 |  | 0.27 (0.11 - 0.69) | **0.006** |
| 90-day GU readmissions | 0.34 (0.17 - 0.71) | **0.004** |  | 0.41 (0.19 - 0.9) | **0.027** |  | 1.76 (0.49 - 6.29) | 0.387 |  | 0.22 (0.07 - 0.65) | **0.006** |
| 30-day GU ER visits | 0.02 (0 - 1.12) | 0.057 |  | 0.03 (0 - 0.27) | **0.002** |  | 3.5 (0.04 - 318.23) | 0.586 |  | 0.50 (0.25 - 0.97) | **0.041** |
| 90-day GU ER visits | 0.04 (0 - 2.01) | 0.106 |  | 0.32 (0.02 - 5.35) | 0.429 |  | 3.48 (0.02 - 601.37) | 0.635 |  | 0.45 (0.13 - 1.57) | 0.209 |
| 365-day additional VUR procedures | 1.02 (0.59 - 1.75) | 0.950 |  | 0.97 (0.43 - 2.23) | 0.950 |  | 0.73 (0.13 - 4.08) | 0.720 |  | 1.15 (0.39 - 3.42) | 0.802 |

M, million; Ureteral stenting was not included in the models for incisional hernia and anastomotic stricture because none of the cases involved stenting; Ureteral injury model provided unstable estimates.

**Continued Supplemental Table S4**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Outcomes | Catheterization duration: Continuous variable |  |  |  |  |  | Operative time:  Continuous variable |  |  |  |  |
|  | Univariable analysis |  |  | Multivariable analysis |  |  | Univariable analysis |  |  | Multivariable analysis |  |
|  | OR (95% CI) | P value |  | aOR (95% CI) | P value |  | OR (95% CI) | P value |  | aOR (95% CI) | P value |
| Postoperative symptomatic UTIs | 0.92 (0.87 - 0.97) | **0.002** |  | 0.93 (0.87 - 0.99) | **0.031** |  | 1 (1 - 1) | 0.472 |  | 1.00 (1 - 1.01) | 0.304 |
| Acute urinary retention | 0.97 (0.96 - 0.99) | **<0.001** |  | 0.99 (0.96 - 1.02) | 0.455 |  | 1 (1 - 1) | 0.514 |  | 1.00 (0.99 - 1.01) | 0.906 |
| Voiding dysfunction | 1.02 (1.01 - 1.02) | **<0.001** |  | 1.11 (1.01 - 1.22) | **0.030** |  | 1 (1 - 1.01) | 0.285 |  | 1.01 (1 - 1.03) | 0.089 |
| Urinary leakage | 0.96 (0.89 - 1.02) | 0.176 |  | 0.89 (0.84 - 0.94) | **<0.001** |  | 1.02 (1.01 - 1.02) | **<0.001** |  | 1.13 (1.09 - 1.16) | **<0.001** |
| Acute ureteral obstruction | 0.97 (0.96 - 0.98) | **<0.001** |  | 0.97 (0.94 - 0.99) | **0.008** |  | 0.99 (0.97 - 1) | **0.030** |  | 1.02 (1 - 1.03) | **0.048** |
| Ureteral injury | 0.96 (0.90 - 1.02) | 0.190 |  | 0 (0 - 0) | 0 |  | 1.01 (1 - 1.02) | **0.020** |  | 0 (0 - 0) | 0 |
| Ureteral stenosis | 0.97 (0.96 - 0.98) | **<0.001** |  | 0.98 (0.96 - 1) | 0.090 |  | 1 (0.99 - 1.01) | 0.824 |  | 1.01 (1 - 1.02) | 0.096 |
| Incision bleeding/bruising | 0.87 (0.82 - 0.92) | **<0.001** |  | 0.92 (0.88 - 0.97) | **<0.001** |  | 1 (0.99 - 1) | **0.005** |  | 1.00 (0.99 - 1.01) | 0.967 |
| Infection of the incision | 0.99 (0.97 - 1.02) | 0.623 |  | 1.01 (0.99 - 1.03) | 0.437 |  | 1.01 (1.01 - 1.01) | **<0.001** |  | 1.01 (1 - 1.01) | 0.055 |
| Incisional hernia | 0.85 (0.49 - 1.46) | 0.560 |  | 0.74 (0.57 – 0.97) | 0.029 |  | 1.01 (0.99 - 1.04) | 0.383 |  | 1.02 (1 - 1.03) | **0.007** |
| Short-term restricted bowel activity | 0.97 (0.93 - 1.01) | 0.094 |  | 0.92 (0.88 - 0.96) | **0.001** |  | 1.02 (1.01 - 1.03) | **<0.001** |  | 1.02 (1.02 - 1.02) | **<0.001** |
| Anastomotic stricture | 0.94 (0.88 – 1.00) | **0.046** |  | 0.92 (0.87 – 0.97) | **0.004** |  | 1 (0.99 - 1.01) | 0.817 |  | 0.99 (0.97 – 1.01) | 0.471 |
| Contralateral reflux | 0.93 (0.88 - 0.98) | **0.004** |  | 0.90 (0.85 - 0.95) | **<0.001** |  | 1.01 (1 - 1.02) | **0.019** |  | 0.99 (0.98 - 1) | **0.019** |
| 30-day GU readmissions | 1.02 (0.98 - 1.06) | 0.272 |  | 0.95 (0.89 - 1.02) | 0.173 |  | 1.02 (1.02 - 1.03) | **<0.001** |  | 1.01 (1 - 1.02) | 0.076 |
| 90-day GU readmissions | 1.27 (1.21 - 1.34) | **<0.001** |  | 1.27 (1.2 - 1.35) | **<0.001** |  | 1.01 (1.01 - 1.01) | **<0.001** |  | 1.01 (1 - 1.02) | 0.109 |
| 30-day GU ER visits | 1.05 (0.97 - 1.13) | 0.233 |  | 0.98 (0.95 - 1.02) | 0.307 |  | 1.03 (1.02 - 1.04) | **<0.001** |  | 1.00 (0.99 - 1.01) | 0.825 |
| 90-day GU ER visits | 1.05 (0.97 - 1.13) | 0.257 |  | 0.99 (0.87 - 1.13) | 0.900 |  | 1.03 (1.02 - 1.03) | **<0.001** |  | 1.00 (0.99 - 1.01) | 0.795 |
| 365-day additional VUR procedures | 0.98 (0.93 - 1.03) | 0.464 |  | 0.97 (0.9 - 1.04) | 0.385 |  | 1 (1 - 1.01) | 0.156 |  | 1.00 (0.99 - 1.01) | 0.986 |

Ureteral stenting was not included in the models for incisional hernia and anastomotic stricture because none of the cases involved stenting; Ureteral injury model provided unstable estimates.

**Continued Supplemental Table S4**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Outcomes | Hospital Stays: Continuous variable |  |  |  |  |  | PS:  Continuous variable |  |  |  |  |
|  | Univariable analysis |  |  | Multivariable analysis |  |  | Univariable analysis |  |  | Multivariable analysis |  |
|  | OR (95% CI) | P value |  | aOR (95% CI) | P value |  | OR (95% CI) | P value |  | aOR (95% CI) | P value |
| Postoperative symptomatic UTIs | 0.91 (0.8 - 1.03) | 0.140 |  | 0.96 (0.88 - 1.04) | 0.315 |  |  |  |  | 0.63 (0.24 - 1.66) | 0.355 |
| Acute urinary retention | 1.01 (0.98 - 1.05) | 0.461 |  | 1.05 (1 - 1.1) | 0.067 |  | - | - |  | 1.64 (0.78 - 3.46) | 0.190 |
| Voiding dysfunction | 0.94 (0.65 - 1.34) | 0.717 |  | 0.57 (0.24 - 1.32) | 0.188 |  | - | - |  | 3.08 (0.21 - 45.9) | 0.414 |
| Urinary leakage | 1.12 (1.11 - 1.13) | **<0.001** |  | 1.24 (1.17 - 1.31) | **<0.001** |  | - | - |  | 3.60 (1.40 - 9.23) | **0.008** |
| Acute ureteral obstruction | 1.11 (1.08 - 1.14) | **<0.001** |  | 1.14 (1.11 - 1.17) | **<0.001** |  | - | - |  | 0.68 (0.28 - 1.62) | 0.385 |
| Ureteral injury | 1.24 (1.21 - 1.26) | **<0.001** |  | Inf (Inf - Inf) | 0 |  | - | - |  | Inf (Inf - Inf) | 0 |
| Ureteral stenosis | 0.91 (0.77 - 1.07) | 0.264 |  | 0.99 (0.94 - 1.05) | 0.825 |  | - | - |  | 4.95 (2.22 - 11.01) | **<0.001** |
| Incision bleeding/bruising | 0.80 (0.68 - 0.95) | **0.009** |  | 0.85 (0.75 - 0.97) | **0.015** |  | - | - |  | 0.49 (0.20 - 1.20) | 0.119 |
| Infection of the incision | 1.06 (1.04 - 1.08) | **<0.001** |  | 1.09 (1.07 - 1.11) | **<0.001** |  | - | - |  | 2.99 (1.49 - 6.01) | **0.002** |
| Incisional hernia | 0.97 (0.61 - 1.54) | 0.909 |  | 1.14 (1.03 – 1.26) | 0.011 |  | - | - |  | 140.47 (8.07 - 2444) | **0.001** |
| Short-term restricted bowel activity | 1.01 (0.99 - 1.04) | 0.290 |  | 0.85 (0.74 - 0.97) | **0.016** |  | - | - |  | 3.43 (2.12 - 5.54) | **<0.001** |
| Anastomotic stricture | 1.01 (0.96 - 1.06) | 0.773 |  | 1.06 (1.01 – 1.11) | **0.011** |  | - | - |  | 0.34 (0.08 – 1.46) | 0.147 |
| Contralateral reflux | 0.99 (0.92 - 1.06) | 0.705 |  | 0.80 (0.7 - 0.92) | **0.002** |  | - | - |  | 5.84 (3.31 - 10.3) | **<0.001** |
| 30-day GU readmissions | 1.06 (1.04 - 1.08) | **<0.001** |  | 1.05 (0.99 - 1.11) | 0.127 |  | - | - |  | 1.15 (0.17 - 7.84) | 0.890 |
| 90-day GU readmissions | 0 (0 - Inf) | 0.648 |  | 0.97 (0.92 - 1.01) | 0.155 |  | - | - |  | 0.73 (0.32 - 1.68) | 0.464 |
| 30-day GU ER visits | 1.16 (1.08 - 1.24) | **<0.001** |  | 1.09 (1.04 - 1.13) | **<0.001** |  | - | - |  | 1.25 (0.18 - 8.60) | 0.820 |
| 90-day GU ER visits | 1.1 (1.06 - 1.15) | **<0.001** |  | 0.99 (0.76 - 1.27) | 0.918 |  | - | - |  | 0.39 (0.17 - 0.89) | **0.026** |
| 365-day additional VUR procedures | 1.24 (1.11 - 1.39) | **<0.001** |  | 1.29 (1.16 - 1.44) | **<0.001** |  | - | - |  | 1.33 (0.08 - 23.29) | 0.846 |

PS, propensity score, included as a covariate to control for any remaining imbalance and reported for transparency, however, its coefficient was not interpreted; Ureteral stenting was not included in the models for incisional hernia and anastomotic stricture because none of the cases involved stenting; Ureteral injury model provided unstable estimates.

**Supplemental** **Table S5** Performance of multivariable predictive models for postoperative outcomes using AUC values

|  |  |  |
| --- | --- | --- |
|  | Multivariable logistic regression models using GEE | |
| Outcomes | AUC in ROC curve  (95% CI) | P value |
| Postoperative symptomatic UTIs | 0.685 (0.615-0.752) | **<0.001** |
| Acute urinary retention | 0.634 (0.541-0.723) | **0.011** |
| Voiding dysfunction | 0.730 (0.593-0.856) | **0.013** |
| Urinary leakage | 0.936 (0.813-1) | **0.004** |
| Acute ureteral obstruction | 0.825 (0.721-0.911) | **<0.001** |
| Ureteral injury | 0.800 (0.600-1) | **<0.001** |
| Ureteral stenosis | 0.646 (0.504-0.776) | 0.086 |
| Incision bleeding/bruising | 0.677 (0.602-0.749) | **<0.001** |
| Infection of the incision | 0.718 (0.622-0.802) | **<0.001** |
| Incisional hernia | 0.883 (0.754-0.992) | 0.054 |
| Short-term restricted bowel activity | 0.848 (0.756-0.918) | **<0.001** |
| Anastomotic stricture | 0.712 (0.307-0.940) | 0.243 |
| Contralateral reflux | 0.811 (0.664-0.939) | **0.013** |
| 30-day GU readmissions | 0.829 (0.766-0.882) | **<0.001** |
| 90-day GU readmissions | 0.867 (0.819-0.909) | **<0.001** |
| 30-day GU ER visits | 0.865 (0.807-0.913) | **<0.001** |
| 90-day GU ER visits | 0.820 (0.758-0.876) | **<0.001** |
| 365-day additional VUR procedures | 0.756 (0.566-0.899) | **0.003** |

**Supplemental Table S6** Univariable and multivariable analyses of the associated healthcare burden—including hospital readmissions, visits, and reoperations—related to postoperative outcomes in the matched cohort

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Predictorsa | Outcomes | Univariable analysis | Multivariable analysis |  |
|  |  | OR (95% CI) | aOR (95% CI) | P value |
| Contralateral reflux | 30-day GU readmissions | 21.14 (10.49 - 42.59) | 13.28 (10.63 - 16.58) | **<0.001** |
| Ureteral injury |  | 6.62 (2.97 - 14.77) | 12.8 (4.5 - 36.38) | **<0.001** |
| Infection of the incision |  | 2.66 (1.67 - 4.26) | 1.42 (1.13 - 1.79) | **0.003** |
| Voiding dysfunction |  | 2.51 (1.06 - 5.97) | 5.27 (1.4 - 19.78) | **0.014** |
| Contralateral reflux | 90-day GU readmissions | 6.39 (2.13 - 19.15) | 10.18 (9.3 - 11.14) | **<0.001** |
| Ureteral injury |  | 2.13 (0.81 - 5.61) | 11.22 (3.92 - 32.09) | **<0.001** |
| Infection of the incision |  | 1.46 (0.67 - 3.17) | 1.59 (1.38 - 1.83) | **<0.001** |
| Voiding dysfunction |  | 2.55 (1.24 - 5.23) | 2.03 (1.75 - 2.36) | **<0.001** |
| Contralateral reflux | 30-day GU ER visits | 11.2 (4.96 - 25.26) | 5.26 (4.05 - 6.84) | **<0.001** |
| Ureteral injury |  | 9.83 (3.93 - 24.6) | 12.48 (3.71 - 41.99) | **<0.001** |
| Infection of the incision |  | 4.37 (2.90 - 6.60) | 3.05 (2.03 - 4.57) | **<0.001** |
| Contralateral reflux | 90-day GU ER visits | 9.74 (4.09 - 23.22) | 4.30 (3.09 - 5.98) | **<0.001** |
| Infection of the incision |  | 3.16 (1.93 - 5.19) | 1.72 (1.35 - 2.19) | **<0.001** |
| Contralateral reflux | 365-day additional VUR procedures | 11.0 (7.28 - 16.63) | 11.50 (6.84 - 19.35) | **<0.001** |
| Ureteral injury |  | 40.00 (25.67 - 62.33) | 35.29 (20.65 - 60.32) | **<0.001** |
| Severe complications (Clavien-Dindo 3-5)b |  | 11.83 (7.26 - 19.28) | 9.76 (5.15 - 18.47) | **<0.001** |
| Postoperative symptomatic UTIsc |  | 2.67 (1.1 - 6.44) | 3.64 (1.09 - 12.17) | **0.036** |

30-, 90- day GUreadmissions: Yes/no; 30-, 90- day ER visits: Yes/no; 365-day additional VUR procedures: Yes/no; Covariates used for adjustment included propensity score, surgical technique, catheterization duration, stent placement, operative time, and hospital time; Ureteral stenting was not included in the models for incisional hernia and anastomotic stricture because none of the cases involved stenting; Missing values for the severity of complications and contralateral reflux were removed from this analysis. aPredictors’ definitions are provided in Supplemental Table S1; bThe severity of complications was recoded as a binary outcome, combining grades 1 and 2 into one group and grades 3, 4, and 5 into another; cPostoperative symptomatic UTIs are defined as febrile UTIs with symptoms such as burning during urination (dysuria), cloudy urine, and/or flank or abdominal pain.

**Supplemental Table S7** Performance of multivariable predictive models for healthcare burden after VUR open reimplantation in the matched cohort using AUC values

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Multivariable logistic regression models using GEE | | | | |
|  | 30-day GU readmissions |  |  | 90-day GU readmissions |  |
| Outcomes | AUC in ROC curve  (95% CI) | P value |  | AUC in ROC curve  (95% CI) | P value |
| Severity of complications | 0.547 (0.435 - 0.660) | 0.398 |  | 0.536 (0.441 - 0.63) | 0.528 |
| Acute urinary retention | 0.476 (0.388 - 0.568) | 0.959 |  | 0.519 (0.43 - 0.607) | 0.660 |
| Voiding dysfunction | 0.715 (0.554 - 0.846) | **0.015** |  | 0.725 (0.580 - 0.856) | **0.014** |
| Urinary leakage | 1 (1-1) | **<0.001** |  | 1 (1 - 1) | **<0.001** |
| Acute ureteral obstruction | 0.573 (0.452 - 0.685) | 0.359 |  | 0.573 (0.449 - 0.682) | 0.373 |
| Ureteral injury | 0.843 (0.54 - 1) | **0.007** |  | 0.691 (0.528 - 0.814) | 0.154 |
| Ureteral stenosis | 0.688 (0.529 - 0.831) | **0.021** |  | 0.681 (0.541 - 0.802) | **0.024** |
| Incision bleeding/bruising | 0.589 (0.502 - 0.67) | 0.075 |  | 0.654 (0.566 - 0.734) | **0.003** |
| Infection of the incision | 0.79 (0.701 - 0.871) | **<0.001** |  | 0.660 (0.582 - 0.742) | **0.005** |
| Incisional hernia | 1 (1-1) | **<0.001** |  | 1 (1 - 1) | **<0.001** |
| Short-term restricted bowel activity | 0.665 (0.534 - 0.769) | **0.024** |  | 0.453 (0.336 - 0.561) | 0.989 |
| Anastomotic stricture | 0.776 (0.619 - 0.944) | 0.093 |  | 0.495 (0.375 - 0.596) | 0.901 |
| Contralateral reflux | 0.977 (0.92 - 1) | **<0.001** |  | 0.767 (0.709 - 0.822) | **0.022** |
| Postoperative UTIs | 0.542 (0.465 - 0.616) | 0.298 |  | 0.706 (0.633 - 0.768) | **<0.001** |

**Continued Supplemental Table S7**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Multivariable logistic regression models using GEE | | | | | | | |
|  | 30-day GU ER visits |  |  | 90-day GU ER visits |  |  | 365-day additional VUR procedures |  |
| Outcomes | AUC in ROC curve (95% CI) | P value |  | AUC in ROC curve (95% CI) | P-value |  | AUC in ROC curve  (95% CI) | P value |
| Severity of complications | 0.630 (0.532 - 0.723) | **0.029** |  | 0.497 (0.388 - 0.598) | 0.932 |  | 1 (1 - 1) | **<0.001** |
| Acute urinary retention | 0.698 (0.614 - 0.767) | **<0.001** |  | 0.669 (0.582 - 0.743) | **<0.001** |  | 0.709 (0.624 - 0.784) | **<0.001** |
| Voiding dysfunction | 0.710 (0.543 - 0.841) | **0.015** |  | 0.731 (0.592 - 0.850) | **0.010** |  | 0.909 (0.811 - 0.975) | **<0.001** |
| Urinary leakage | 1 (1 - 1) | **<0.001** |  | 1 (1 - 1) | **<0.001** |  | 1 (1 - 1) | **<0.001** |
| Acute ureteral obstruction | 0.644 (0.532 - 0.739) | 0.063 |  | 0.637 (0.514 - 0.734) | 0.097 |  | 0.796 (0.662 – 0.908) | **<0.001** |
| Ureteral injury | 0.919 (0.794 - 1) | **<0.001** |  | 0.769 (0.671 - 0.885) | **0.038** |  | 0.998 (0.99 - 1) | **<0.001** |
| Ureteral stenosis | 0.682 (0.531 - 0.827) | **0.028** |  | 0.642 (0.484 - 0.794) | 0.080 |  | 1 (1 - 1) | **<0.001** |
| Incision bleeding/bruising | 0.497 (0.399 - 0.589) | 0.877 |  | 0.597 (0.511 - 0.679) | 0.070 |  | 0.745 (0.671 - 0.811) | **<0.001** |
| Infection of the incision | 0.854 (0.783 - 0.912) | **<0.001** |  | 0.807 (0.724 - 0.880) | **<0.001** |  | 0.653 (0.540 - 0.757) | **0.012** |
| Incisional hernia | 1 (1 - 1) | **<0.001** |  | 1 (1 - 1) | **<0.001** |  | 0.992 (0.98 - 1) | **<0.001** |
| Short-term restricted bowel activity | 0.627 (0.487-0.749) | 0.067 |  | 0.619 (0.486 - 0.737) | 0.098 |  | 0.773 (0.675 - 0.855) | **<0.001** |
| Anastomotic stricture | 0.486 (0.100 - 0.724) | 0.910 |  | 0.497 (0.159 - 0.717) | 0.881 |  | 1 (1 - 1) | **<0.001** |
| Contralateral reflux | 0.943 (0.822 - 1) | **<0.001** |  | 0.943 (0.820 - 1) | **<0.001** |  | 0.991 (0.978 - 1) | **<0.001** |
| Postoperative UTIs | 0.564 (0.487 - 0.642) | 0.172 |  | 0.589 (0.514 - 0.663) | **0.024** |  | 0.974 (0.952 - 0.991) | **<0.001** |