Lower Urinary Tract Injury in Women in the United States, 1979-2006

1. Description of the Study
   1. Primary objective: to determine the age-adjusted rates of lower urinary tract injury and incidence in nonobstetric procedures from 1979-2006
   2. Secondary objective: to determine the incidence of lower urinary tract injuries among women undergoing hysterectomy, SVD, operative vaginal delivery, and c-section.
2. Methods
   1. The National Hospital Discharge Survey was used to identify women who sustained bladder and ureteral injuries.
      1. 270,000 inpatient records
      2. 466 hospitals
      3. Overall data set error rate for final diagnoses and procedures is 1.0% and 0.7%
   2. ICD-9 codes were used to estimate the annual number of inpatient gynecologic procedures performed between 1979-2006
   3. Hysterectomy was broken down into sub-types: subtotal abdominal hysterectomy (SAH), laparoscopic supracervical hysterectomy (LASH), total abdominal hysterectomy (TAH), total vaginal hysterectomy (TVH), laparoscopic assisted vaginal hysterectomy (LAVH), and radical abdominal hysterectomy (RAH)
   4. Obstetric bladder injuries also included urethral injuries
   5. Age adjusted rates for bladder injuries, ureteral injuries, inpatient gynecologic procedures, and c-section were calculated using 1990 census data for women over age 18.
      1. Age adjustment and frequencies were determined for each year between 1979-2006
   6. Linear regression was used to look at trends in bladder and ureteral injury.
   7. Statistical significance was se at P<0.05
3. Results
   1. AARs of inpatient gyn procedures decreased from 35.2/1000 to 11.9/1000 women
      1. AARs of ureteral injury per 1000 women decreased from 0.06 to 0.03 (p<0.001)
      2. AARs of nonobstetric bladder injury decreased from 0.13 to 0.05/1000 women (p=0.11)
   2. In 2006, 64% of ureteral injuries recognized at the time of surgery were in non-gyn procedures
   3. In 2006, 87% of nonobstetric bladder injuries recognized at the time of surgery were at the time of gyn procedures
   4. Among gynecologic patients:
      1. Incidence of bladder injury was highest with LAVH and VH
      2. Ureteral injury recognized at the time of hysterectomy was most common with TAH and least common with LAVH
      3. Most common indication for surgery in patients with bladder injury: urinary incontinence
      4. Most common indication for hysterectomy in patients with ureteral injury: malignancy
   5. Among obstetric patients:
      1. Urethral or bladder injury occurred at the following rates:
         1. SVD: 10.3/1000
         2. OVD: 4.8/1000
         3. C-section: 0.006/1000
4. Discussion
   1. Weaknesses:
      1. the dataset used allows only for initial cases, not subsequent procedures, so only initially recognized injuries were included
      2. coding discrepncies could have led to inaccurate numbers
      3. periurethral laceration at time of SVD is coded using the same code for urethral and bladder injuries
   2. Strengths:
      1. Large dataset over 28 year period of time allowed for extensive evaluation of trends in procedure rates as well as in injury rates

Changing Trends in the Management of Iatrogenic Ureteral Injuries

Las D, Abarbanel J, Luttwak Z, Manes A, Mukamel E

Journal of Urology

154:1693-1695, 1995

1. Description of the Study
   1. What was the purpose of the research?
      1. To evaluate and compare the outcomes between surgical repair versus placement of a Percutaneous nephrostomy tube for the management of iatrogenic ureteral injury
   2. Why is the research being conducted, and why is it considered significant?
      1. Changing trends in iatrogenic ureteral injury management have seen a decrease in the reoperation rate after the introduction of the perc neph tube. This article is trying to address whether the perc neph tube is just as efficacious in ureteral injury management as the traditional surgical routes
   3. Were the research questions, objectives or hypothesis(es) clearly stated?
      1. The primary outcomes/objectives/hypotheses were not clearly specified in the introduction, but within the results section, the outcomes were stated. There was never a hypothesis stated.
2. Sample
   1. Who were the subjects?
      1. 44 total participants (38 women, 6 men) with iatrogenic ureteral injuries diagnosed postoperatively (36 GYN, 6 CRS, 2 URO)
         1. 24 underwent surgery
            1. 16 complete obstruction – end-to-end reanastomosis
            2. 6 ureterovaginal fistula – uretero neocystostomy
            3. 2 retroperitoneal extravasation – end-to-end reanastomosis
         2. 20 underwent perc neph placement
            1. 12 complete obstruction
            2. 4 ureterovaginal fistula
            3. 3 retroperitoneal extravasation
            4. 1 ureterosigmoid fistula
   2. Were the inclusion/exclusion criteria specified?
      1. Included were **all** patients with iatrogenic ureteral injuries (consecutive) diagnosed postoperatively
      2. Excluded were patients with intraoperative dx and surgical repair, and severe ureteral injuries that would obviously not spontaneously resolve (not enough detail given about this exclusion – need definition of ‘severe’ and *why* they wouldn’t resolve)
   3. How representative is the sample?
      1. 82% GYN, 23% CRS, 5% URO (Literature sites: 34-75% GYN, 24% CRS, 42% URO) – not exactly representative, and with small sample numbers, difficult to generalize to population – although we know that ureteral injuries are rare to begin with, making it difficult to study; no power analysis mentioned
   4. Was there any selection bias evident in the sample selection?
      1. Used a date cutoff for their sample selection, which could potentially have created a bias – surgeons may have been less proficient with their repairs in the former years, surgeons performing the initial surgeries could have been less proficient in the former years – no mention of surgeon skill/experience in either sample subsets
3. Method and Design
   1. Describe the study design. Is it appropriate?
      1. Difficult to tell what type of study this is: non-randomized quasi-experimental versus retrospective cohort where they compare the management of all patients with ureteral injuries (they mention performing a chart review, but it also seems like they planned to stop doing surgical repair at a particular date and follow those patients, which would be a prospective cohort, but there really wasn’t any mention of type of study design). Also, no discussion of a set follow-up time interval – just mention 16 patients had spontaneous recovery between 14 and 66 days – no other details given (was it closer to 14 days for most patients, or closer to 66 days, how often did they follow these patients: did they do imaging weekly, etc).
   2. How was the research conducted (the study procedure itself) and the data collected?
      1. Data collected from hospital and outpatient clinic charts
   3. Were the subject’s rights protected?
      1. No mention of patient confidentiality
   4. Was IRB approval obtained?
      1. No mention of IRB (study conducted in Israel)
4. Analysis
   1. How were the data analyzed?
      1. The data were analyzed very superficially – no statistical testing was performed. Raw numbers and percentages were the only thing analyzed and provided in the paper.
   2. Do the selected statistical tests appear appropriate?
      1. No statistical tests used, only percentages calculated
   3. Were the results significant?
      1. No p values or confidence intervals calculated, so cannot say if results were significant
5. Results
   1. What were the findings of the study?
      1. The authors looked at five things: etiology of injury, presenting sx’s, radiological findings, management and outcome of ureteral injury repair
      2. Etiology of injury: 82% GYN-related, 22/36 during TAH, 4 C/S, 4 TVH, 6 other GYN procedures; 23% CRS, 3 during anterior resection, 3 Miles’ operation; 5% URO - 2 prostatectomies
      3. Presenting symptoms: flank pain, fever and urinary leakage were most common (82%, 34%, 34%)
         1. Ureterovaginal fistula seen in 10 patients – presented 5-17 days psotop
         2. Ureterocutaneous fistula / retroperitoneal extravasation? in 5 patients presented 8-25 days postop
      4. Radiologic findings: IVP was performed in all 44 patients and found hydroureteronephrosis in all 44 patients, found complete obstruction in 28 patients, ureterovaginal fistula in 3, retroperitoneal extravasation in 3 and ureterosigmoid fistula in 1 patient; Renal US was performed in 35 patients (why only done in 35 of the 44 patients is not explained), found hydronephrosis in 28 of the 35 patients, read as ‘normal’ in 7 patients; retrograde pyelogram performed in 23 patients and found obstruction in 19 of the 23 patients
      5. Surgical repair: 16 patients with complete obstruction had end-to-end anastomosis vs 12 patients with complete obstruction that only received perc neph tubes, 6 UV fistulas had ureteroneocystostomy vs 4 with perc neph tube placement
      6. Follow up: spontaneous recovery in 16 patients 14-66 days after placement of the perc neph tube – not much mention of follow up and how they determined spontaneous recovery – only thing mentioned was 1 patient demonstrated moderate hydronephrosis and 4 patients had persistent evidence of injury 68-92 days from perc neph tube placement which required surgical repair. They also found 18 of the patients with surgical repair had UTI postop and only 4 of the PNT had UTI
   2. Are the results presented in a clear and understandable way?
      1. Results listed in well-designed tables, but there was no explanation of why they looked at certain outcomes – i.e. why did they look at radiological findings and why did only some patients get the renal US and retrograde?
   3. How did the authors interpret the results?
      1. They interpreted the results as the insertion of a perc neph tube resulted in *significantly* decreased reoperation and morbidity rates, and enabled spontaneous recovery of the injured ureter in a *significant* number of patients – how do they determine this?? No statistical analysis performed comparing the two groups!
   4. Were there any study limitations discussed?
      1. No study limitations were discussed
6. Clinical Significance
   1. What were the implications of this study to clinical practice?
      1. I would be afraid to apply the results of this study to clinical practice but the authors conclude that ureteral injuries can be primarily managed with perc neph tube placement – however they do not go into specifics as far as how long to wait for spontaneous recovery, how to follow these patients, what to look out for, risks, etc.
   2. How does the study contribute to the body of knowledge?
      1. I think it contributes just an interesting finding that ureteral injuries have the potential for spontaneous recovery
   3. Could the study be replicated?

Yes, this study could be replicated by the way the authors describe it, but I don’t think it should be replicated to answer the question they are trying to answer – there are much

Laparoscopic ureteroneocystostomy

1. Description of the Study
   1. What was the purpose of the research?
      1. To assess the results of laparoscopic ureteroneocystostomy with a psoas hitch for iatrogenic lower ureteral injuries leading to a ureterovaginal fistula
   2. Why is the research being conducted, and why is it considered significant?
      1. To evaluate if this procedure is a safe and effective alternative to open procedures
   3. Were the research questions, objectives or hypothesis(es) clearly stated?
      1. Yes, the authors describe their intent of this paper was to present their experience with laparoscopic ureteroneocystostomy in patients presenting or referred a few weeks after ureteral injury who had a ureterovaginal fistula
2. Sample
   1. Who were the subjects?
      1. 18 patients with iatrogenic lower ureteral injuries during hysterectomy leading to ureterovaginal fistula who underwent laparoscopic ureteroneocystostomy with psoas hitch
   2. Were the inclusion/exclusion criteria specified?
      1. All patients were referred from elsewhere 1 to 6 weeks after surgery
      2. Of the patients 11 underwent laparoscopic assisted vaginal hysterectomy, 4 underwent open hysterectomy and 2 underwent vaginal hysterectomy for benign disease of the uterusOne patient with a ruptured gravid uterus underwent emergency laparotomy and hysterectomy
      3. All patients had undergone prior endourological procedures, which were unsuccessful
      4. All patients had an ipsilateral percutaneous nephrostomy to preserve renal function
      5. a radiological study was done to access stricture length
      6. All fistulas were pelvic fistulas associated with stricture or complete obliteration of the ureteral lumen
      7. One patient was excluded due to inability to perform the reimplantation laparoscopically
   3. How representative is the sample?
      1. This is difficult to tell based on the limited information given on the demographics of the sample. Being that the majority of iatrogenic ureteral injury-related ureterovaginal fistulas result from hysterectomies, this sample is fairly representative in that aspect. There was no mention as to the difficulty of the hysterectomy, indication for the hysterectomy, skill of the surgeon, etc.
   4. Was there any selection bias evident in the sample selection?
      1. Not that was clearly evident. It appears as if they included all ureteral injury-related ureterovaginal fistulas that were referred to them, but this was never clearly stated.
3. Method and Design
   1. Describe the study design. Is it appropriate?
      1. It is not clearly described what the design of the study is exactly, but it appears as if this is a non-randomized prospective series evaluating the efficacy of ureteral reimplantation and psoas hitch laparoscopically. This is a fairly appropriate study design, in that the sample population is difficult to accumulate prospectively, therefore a randomized control trial with a laparoscopic group and an open group would be very difficult to get at one institution.
   2. How was the research conducted (the study procedure itself) and the data collected?
      1. They describe the preoperative testing on all patients that included: voiding cystography, cystoscopy and retrograde ureterography. They also describe the procedure in a fair amount of detail. The follow up included a 3 month postop cystogram and IVP, and Q3 month US and UA for 2 years. In the study design section the authors state that the data that was collected for analysis included BMI in kg/m2, operative time in minutes, blood loss in ml, hospitalization in days and average followup such as time to oral intake, time to nephrostomy removal, etc. In the conclusion, however the authors describe that there was no vesicoureteral reflux or leakage noted despite no postoperative stent used – this was not mentioned at the beginning of the article as something they were specifically looking at, so these may be a secondary outcome/result.
   3. Were the subject’s rights protected?
      1. This was not explained in the paper
   4. Was IRB approval obtained?
      1. This was not explained in the paper
4. Analysis
   1. How were the data analyzed?
      1. There were no comparisons between groups performed therefore no statistical testing was performed. Raw data and calculated means with ranges were provided for the variables collected on the patients.
   2. Do the selected statistical tests appear appropriate?
      1. N/A
   3. Were the results significant?
      1. N/A
5. Results
   1. What were the findings of the study?
      1. Operative time (hrs)\* 2.5 (1.9–2.8)

Blood loss (ml) 90 (60–150)

Time to oral intake (hrs) 8.2 (6.7–10.1)

Time to ambulation (hrs) 14 (9.2–18)

Hospital stay (days) 5.3 (5–7)

Time to nephrostomy removal (days) 7

Time to catheter removal (days) 7

* 1. Are the results presented in a clear and understandable way?
     1. Yes, the results are clear
  2. How did the authors interpret the results?
     1. The interpretation provided in the conclusion was that the extravesical

modified Lich-Gregoir technique combined with a psoas hitch is associated with a low incidence of postoperative vesicoureteral reflux. None of the patients had obstruction or urinary leakage despite no Double-J stent use

* 1. Were there any study limitations discussed?
     1. No study limitations discussed

1. Clinical Significance
   1. What were the implications of this study to clinical practice?
      1. That ureteral reimplantation with psoas hitch can be performed laparoscopically without additional morbidity

Ureteric reconstruction

Current opinions in Urology

# Defining the need for ureteral reconstructive procedures

## Trauma

### Extrinsic – penetrating trauma i.e. gunshots

### Intrinsic – abdominopelvic surgery i.e. gynecologic procedures

## Undiversion – revision of incontinent urinary diversion

## Congenital anomalies – clinically relevant anomalies need revision

### Termination

### Structure

### Number

# Traditional techniques

## Ureteroureterostomy

### When recognized immediately

### Tension-free, spatulated repair

## Ureteroneocystostomy

### Secondary repair of a distal ureteral injury

### Psoas hitch, boari flap if needed

# Ureteral replacement

## Performed only after other methods have failed or are deemed inappropriate

## Most commonly with ileal graft

## Associated with multiple potential complications, >10% patients experience severe complications

### Hyperchloremic metabolic acidosis

### Anastomotic stricture

### Ileal graft obstruction and renal failure

# Laparoscopy and robotics

## Simmons et al – retrospective review of lsc (n=12) vs open (n=34) ureteroureterostomy, ureteroneocystostomy and boari flap procedures

### No statistically significant difference in complication rates

### Nonrandomized, multiple sources of bias

## Advantages of robot-assist

### Endowrist technology, tremor reduction, 3D visualization

### Author presents several reports and studies of successful robotic-assisted urologic procedures

# Transureteroureterostomy

## Prior radiation or hx IBD may make ileal replacement or boari flap procedures impossible

## May jeopardize the healthy renal unit

## Joung et al – 28 patients transureteroureterostomy vs 17 end-to-end ureteroureterostomy or ureteroneocystostomy – found no differences in complication rates

# Conclusion

## Many ureteric reconstruction/replacement techniques have remained unchanged

## Intestinal ureteral replacement may be successful alternative in particular group of patients

## Outcomes for laparoscopic and robotic surgical techniques appear to be promising for patient recovery and hospital-stay