Outcomes of Metallic Stents for Malignant Ureteral Obstruction

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Purpose: Malignant ureteral obstruction often necessitates chronic urinary diversion and is associated with high rates of failure with traditional ureteral stents. We evaluated the outcomes of a metallic stent placed for malignant ureteral obstruction and determined the impact of risk factors previously associated with increased failure rates of traditional stents.

Materials and Methods: Patients undergoing placement of the metallic Resonance® stent for malignant ureteral obstruction at an academic referral center were identified retrospectively. Stent failure was defined as unplanned stent exchange or nephrostomy tube placement for signs or symptoms of recurrent ureteral obstruction (recurrent hydroureteronephrosis or increasing creatinine). Predictors of time to stent failure were assessed using Cox regression.

Results: A total of 37 stents were placed in 25 patients with malignant ureteral obstruction. Of these stents 12 (35%) were identified to fail. Progressive hydroureteronephrosis and increasing creatinine were the most common signs of stent failure. Three failed stents had migrated distally and no stents required removal for recurrent infection. Patients with evidence of prostate cancer invading the bladder at stent placement were found to have a significantly increased risk of failure (HR 6.50, 95% CI 1.45–29.20, p = 0.015). Notably symptomatic subcapsular hematomas were identified in 3 patients after metallic stent placement.

Conclusions: Failure rates with a metallic stent are similar to those historically observed with traditional polyurethane based stents in malignant ureteral obstruction. The invasion of prostate cancer in the bladder significantly increases the risk of failure. Patients should be counseled and observed for subcapsular hematoma formation with this device.

Key Words: stents, ureteral obstruction

Abbreviations and Acronyms

CT = computerized tomography

GU = genitourinary

MUO = malignant ureteral obstruction

PCN = percutaneous nephrostomy tube

XRT = external radiation therapy

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MALIGNANT ureteral obstruction can result from a variety of malignancies via extrinsic compression of the ureter from a primary or metastatic mass effect.[1–3] The prognosis for these patients is universally poor, with multiple studies reporting overall survival of less than 1 year after intervention for MUO.[4–6] Ureteral stenting may be indicated to minimize pain or to maximize renal function, especially if further chemotherapy is planned.[3] Unfortunately failure rates of 35% to 45% have been reported for traditional polyurethane ureteral stents in MUO.[7–9]

A metallic coiled Double-J® ureteral stent manufactured from a nickel-cobalt-chromium-molybdenum alloy was recently developed (Resonance®, Cook Medical, Bloomington, Indiana). This stent has a reported dwell time of up to 12 months and has been used clinically since 2006.[10] Failure rates have

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varied from 7% to 66% in a small number of retrospective series.[11–15] Of note, although no prior studies have focused exclusively on patients with MUO, subset analyses revealed higher failure rates with MUO in multiple series.[11,14,15]

Given the indefinite need for urinary diversion in MUO, these patients would benefit a great deal from more durable ureteral stents. Therefore, we reviewed the outcomes of this stent when placed specifically for MUO. In addition, given this novel stent material and design, we hypothesized that risk factors for failure which have been identified for traditional stents, including the presence of malignant bladder invasion,[9] would not impact the outcome of this metallic device.

MATERIALS AND METHODS

Data from all patients undergoing placement of the metallic Resonance ureteral stent at Duke University Medical Center were retrospectively obtained following institutional review board approval. Inclusion criteria were biopsy proven malignancy and hydroureteronephrosis consistent with MUO on CT, ultrasound, magnetic resonance, diuretic renography or retrograde urography. The study interval was September 2010 through July 2011. Covariates assessed included age, gender, type of underlying malignancy, laterality, level of obstruction, stent length, prior ureteral stent or PCN placement, prior radiation treatment, urine cultures, serum creatinine, presence of ileal conduit, and presence of visible tumor seen invading the bladder at the time of stent placement.

All stents were placed in a retrograde fashion with fluoroscopic guidance. No stents were placed anterograde and no stent placement attempts were unsuccessful. Ureteral balloon dilation was not required for any case. Nine different surgeons placed the stents. All stents had a 6Fr diameter and length ranged from 20 to 28 cm. Following retrograde urography the supplied outer sheath with inner cannula was placed coaxially over a guidewire advanced to the level of the renal pelvis under fluoroscopy. The guidewire and inner cannula were then removed, and the stent was advanced through the sheath, using the cannula as a pusher, until a proximal curl was observed fluoroscopically in the renal pelvis. The sheath was then withdrawn over the cannula such that the distal stent curl was observed fluoroscopically in the bladder. Final fluoroscopy images were obtained to confirm proper stent position before concluding the procedure. Postoperative studies included serum creatinine with abdominal plain films, CT or ultrasound at intervals determined by the treating physician.

Stent failure was defined as unanticipated stent exchange or nephrostomy tube placement for signs or symptoms of recurrent ureteral obstruction (recurrent hydroureteronephrosis or increasing creatinine). Increased creatinine without concomitant hydroureteronephrosis, suggestive of intrinsic or prerenal disease, was not considered stent failure. Median followup duration was calculated with a reverse Kaplan-Meier estimator. Predictors of time to stent failure were assessed using univariate Cox regression. Three patients were identified with no followup data after the initial stent insertion and were censored from this time to event analysis. Univariate analyses were used for predictive calculations as the low number of events precluded accurate multivariate regression modeling. All analyses were conducted using STATA® v.11 with a 2-sided alpha of 0.05.

RESULTS

A total of 37 stents were placed in 25 patients (18 men, 7 women). Twenty-one (56%) were placed for GU malignancies, and 16 were placed for other malignancies including gastrointestinal (19%, 7 of 37), gynecologic (16%, 6 of 37), lymphoma (3%, 1 of 37) and other (5%, 2 of 37). Seven patients underwent bilateral stent placement. Stents were placed as conversion from traditional stents (49%, 18 of 37), as the initial intervention for MUO (19%, 7 of 37), as salvage interventions in patients in whom traditional stents had failed (19%, 7 of 37) or as replacements in those with metallic stent failure (14%, 5 of 37). There were 21 (57%) patients with prior external radiation therapy to the abdomen or pelvis. Bladder invasion visualized on cystoscopy was present in 4 patients (11%), all with prostate cancer. Three patients died with a stent in place. An additional 3 patients were lost to followup (not seen at our institution in the last 12 months) and, thus, were censored from our outcome analyses.

After a median followup of 13 weeks 12 stents (35%) had failed. Progressive hydroureteronephrosis (58%, 7 of 12) and increasing creatinine (50%, 6 of 12) were the most common signs of stent failure (not mutually exclusive). Three failed stents (25%) had migrated distally. None of the 6 stents placed for proximal ureteral obstruction failed. No stents required removal for recurrent infection. Median time to failure was 14 weeks from placement. The majority of stent failures (75%, 9 of 12) were identified by serum creatinine or imaging obtained during routine oncologic surveillance. Stent failures were managed by placing an alternative ureteral stent (17%, 2 of 12) or nephrostomy tube (17%, 2 of 12). Two cases (17%) of stent migration with a mild increase in creatinine were managed with observation and 1 (8%) migrated stent associated with significant hydronephrosis was managed with metallic stent replacement. Five failed metallic stents were managed with removal and replacement with a second metallic stent, and none of these replacements went on to fail during the study period. Of the 9 patients without discomfort at the time of stent failure, hydronephrosis or renal failure stabilized in 4, improved in 3, worsened in 1 or was not assessed in 1 after intervention. One patient (3%, 1 of 37) progressed to a scheduled metallic stent exchange during the study period.