The Natural History of Nonobstructing Asymptomatic Renal Stones Managed with Active Surveillance

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Purpose: We documented the natural history of asymptomatic nonobstructing renal calculi managed with active surveillance and explored factors predicting stone related events to better inform shared decision making.

Materials and Methods: Patients with asymptomatic nonobstructing renal calculi electing active surveillance of their stone(s) were retrospectively reviewed. Stone characteristics, patient characteristics, and stone related events were collected. We evaluated the effects of stone size and location on development of symptoms, spontaneous passage, requirement for surgical intervention, and stone growth.

Results: We identified 160 stones with an average size of 7.0 ± 4.2 mm among 110 patients with average followup of 41 ± 19 months. Forty-five (28% of total) stones caused symptoms during followup. Notably 3 stones (3% of asymptomatic subgroup, 2% of total stones) caused painless silent obstruction necessitating intervention after an average of 37 ± 17 months. The only significant predictor of spontaneous passage or symptom development was location. Upper pole/mid renal stones were more likely than lower pole stones to become symptomatic (40.6% vs 24.3%, $p = 0.047$) and to pass spontaneously (14.5% vs 2.9%, $p = 0.016$).

Conclusions: Among asymptomatic nonobstructing renal calculi managed with active surveillance, most remained asymptomatic through an average followup of more than 3 years. Less than 30% caused renal colic, less than 20% were operated on for pain and 7% spontaneously passed. Lower poles stones were significantly less likely to cause symptoms or pass spontaneously. Despite 3 stones causing silent hydronephrosis suggestive of obstruction, regular followup imaging facilitated interventions that prevented renal loss.

Key Words: kidney calculi, asymptomatic diseases, watchful waiting

Abbreviations and Acronyms

ARC = asymptomatic nonobstructing renal calculi

AS = active surveillance

BMI = body mass index

CT = computerized tomography

KUB = plain x-ray of the kidneys, ureters and bladder

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Nothing to disclose.

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Editor's Note: This article is the fourth 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 1448 and 1449.

THE age controlled prevalence of kidney stones in the United States has increased markedly from 5.2% in 1994 to 8.4% in 2010.[1] Associated health care costs are estimated at well over $2 billion annually.[2] The proportion of kidney stones that are asymptomatic nonobstructing renal calculi found incidentally on unrelated imaging is unknown but is presumably increasing as the use of radiologic services continues to increase.[3,4] Therefore, optimizing management of ARC is paramount to

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maximizing patient outcomes and minimizing unnecessary stone related spending.

Available literature on active surveillance as a management strategy for ARC is limited to a small number of retrospective[5–7] and prospective[8–10] studies that have reported spontaneous passage rates of 3% to 20% and intervention rates of 7% to 26%. Keeley et al compared AS to prophylactic extracorporeal shock wave lithotripsy in patients with small ARC and found no significant differences in stone-free rate, quality of life, renal function, symptoms or hospital admissions between the 2 groups during an average of followup of 2 years.[10] However, a policy of observation may ultimately necessitate the use of more invasive therapies when compared with prophylactic interventions.

Prior studies have also suggested that lower pole location and smaller stone size may be protective against adverse outcomes.[5–7] In 2013 the European Association of Urology issued a grade C recommendation that asymptomatic calyceal stones can be followed with AS including annual followup imaging for 2 to 3 years while intervention should be considered after this period.[11] The American Urological Association has not yet released a guideline statement on this issue. We documented the natural history of ARC managed with AS, and explored predictive factors for stone related events to add to the existing literature and better inform shared decision making.

MATERIALS AND METHODS

We retrospectively identified all patients with documented ARC seen by a single surgeon between June 25, 2008 and December 28, 2010 who elected AS of their stone(s) with routine followup imaging. All patients with ARC were counseled regarding management options including AS and possible surgical interventions as dictated by stone size and location. Our AS protocol consisted of recommended renal ultrasound 6 months after initial presentation with continued followup renal ultrasound every 6 months in cases of increasing stone size or burden or every 12 months in cases of stone stability with the intention to treat if the patient experienced severe pain attributable to obstruction or silent hydronephrosis. Patients with at least 6 months of documented followup were eligible for study inclusion. When possible, we reviewed documented medical encounters from before June 25, 2008 to identify the first radiologic observation of the ARC(s). Patients were not excluded from study based on a history of stone related intervention(s). However, asymptomatic stones that were believed to be fragments from prior stone related intervention were excluded.

CT, ultrasound and KUB images from our institution and from outside institutions were used as methods of diagnostic and followup imaging. We collected data on stone characteristics (size, location, and date and modality of first radiographic visualization for the largest nonobstructing stone present in each kidney), patient characteristics (age, BMI at inclusion, gender, and history of prior stones) and stone related events (elective stone removal, stone growth, spontaneous passage, development of renal colic defined as ipsilateral abdominal or flank pain that a medical provider thought was most likely attributable to nephrolithiasis, development of silent obstruction, emergency department visits and surgical intervention for pain). We then compared the effects of stone size (less than 1 cm, or 1 cm or greater) and location (upper/mid renal and lower pole) on development of symptoms, spontaneous passage, requirement for surgical intervention and stone growth greater than 50% of initial size using chi-square and bivariate logistic regression analysis. Patients who electively underwent intervention without symptoms or in whom silent hydronephrosis developed were included in the natural history analysis and excluded from the predictive analyses.

RESULTS

Baseline Patient and Stone Demographics

Table 1 presents baseline characteristics of the entire cohort. We identified 160 stones (84 left and 76 right) with an average size of 7.0 ± 4.2 mm among 110 patients (60 male and 50 female). Average patient age was 56 ± 14 years and average BMI was 30 ± 9 kg/m^2. Stones were initially identified using CT (79, 49.4%), ultrasound (78, 48.8%) or KUB (3, 1.8%). No renal units were lost during followup.

Natural History of ARC

The supplementary table (http://jurology.com/) presents the clinical outcomes of our stone cohort. Overall 115 stones (72% of total) did not cause renal colic. Eighteen stones (11% of total) were followed and then treated electively. Notably 3 stones (2% of total) caused painless silent hydronephrosis necessitating intervention and 45 stones (28% of total) did cause symptoms. There were 27 stones (17% of total) that required surgery for renal colic or symptomatic obstruction, and 33 stones (21% of total) grew to greater than 50% of their initially documented size. The majority of these high growth

Table 1. *Baseline patient demographics and stone characteristics*

Mean ± SD mos followup (range)	40.6 ± 18.6	(7–86)
Mean ± SD pt age (range)	55.8 ± 13.8	(19–82)
Mean ± SD mm initial stone diameter (range)	7.0 ± 4.2	(1–25)
Mean ± SD kg/m^2 BMI (range)	30.0 ± 9.3	(17–85)
No. male (%)	60	(55)
No. stone history (%)	140	(87)
No. multiple stones (%)	122	(76)
No. stone location (%):		
Lower pole	41	(25)
Mid calyx	35	(22)
Upper calyx	81	(51)
Renal pelvis	3	(2)