

An Audit of Renal Stone Biochemical Analysis in NHS Highland

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BACKGROUND

- Renal stones are a common medical problem; 1 in 11 people will suffer renal stone symptoms during their lifetime.
- Patients who have had one renal stone have a 50% chance of forming another one within the next 10 years.
- NHS Highland covers over 32,500 square kilometres, making it one of the UK's largest health boards in geographical terms. Patients can face significant travel distances and challenges should they need to visit hospital with medical problems.
- Metabolic stone investigations including blood tests, urinalysis, and stone analysis can help identify patients at risk of repeat stone formation and guide treatment and prevention strategies.
- A multidisciplinary approach between biochemistry, urology and renal teams can be useful in the management of recurrent stone-forming patients.

OBJECTIVES

- To document current practice of renal stone biochemical analysis and metabolic stone assessment in NHS Highland.
- To document the demographics and characteristics of stone-forming patients in NHS Highland.

STANDARDS

- The British Association of Urological Surgeons (BAUS) recommends 24-hour urine analysis in patients with one of the following risk factors:
 - < 30 years old
 - With a strong family history of renal stones
 - Who formed multiple or bilateral stones
 - With specific stone biochemistry e.g. cystine or uric acid stones
 - With anatomical abnormalities that increase chances of stones

METHODS

- A retrospective review of all renal stones sent for biochemical analysis was conducted, looking at a five-year period between 2015-2019.
- The clinical portal was reviewed for each renal stone and data collected included:
 - Patient demographics
 - What stone treatments were undertaken
 - Stone composition
 - Other biochemical investigations undertaken
 - Structural abnormalities of the renal tract
- Exclusions: bladder stones from cystolitholapaxy cases and prostatic stones retrieved during Transurethral Resection of the Prostate.

RESULTS

Demographics:

- 123 renal stones were sent for analysis, from 119 patients
- 33 females & 86 males had renal stones analyzed
- Mean age = 55.2 years (range 25-81 years, median 55 years)
- 5 patients were less than 30 years of age

Patient Characteristics:

- 61/119 (51.3%) patients were classified as high-risk stone formers as per BAUS recommendations
- 70/119 (58.8%) patients were 1st time stone formers
- 41/119 (34.5%) were recurrent stone formers
- 8/119 (6.7%) had bilateral renal stones
- 4/119 (3.4%) had anatomical renal tract abnormalities (duplex system, obstructive cyst, hypotonic collecting system and medullary sponge kidney)

RESULTS

Biochemical Investigations:

- 108/119 (90.8%) patients had serum calcium measured
- 62/119 (52.1%) had serum urate measured
- 11/119 (9.2%) had 24-hour urine analysis
- 1 patient had spot urinary electrolytes measured

What about investigation of the high risk patients?

- Of the patients <30 years of age, 4/5 (80%) had serum calcium and 1/5 (20%) had serum urate measured
- 8/49 (16.3%) recurrent/bilateral stone formers and 1/5 (20%) patients under 30 years had 24-hour urine analysis.
- No patients with unusual stone biochemistry or renal tract structural abnormalities had 24-hour urine analysis
- 8/61 (13.1%) high-risk stone formers had 24-hour urine analysis.

- Only 5/61 (8.2%) high-risk stone formers had the triad of biochemical investigations (serum calcium, urate and 24-hour urine analysis)

Stone Characteristics:

- 61/123 (49.6%) stones were passed spontaneously
- 62/123 (50.4%) stones were extracted surgically

Stone composition	
Calcium Oxalate	78/123 (63.4%)
Carbonate Apatite	14/123 (11.4%)
Uric Acid	14/123 (11.4%)
Calcium Phosphate	13/123 (10.6%)
Cystine	2/123 (1.6%)
Other	2/123 (1.6%)

COMPLIANCE WITH STANDARDS

How did we do at meeting the BAUS recommendations for undertaking 24-hour urine analysis?

RISK FACTOR	COMPLIANCE
If the patient is young (<30 years old when they formed their first stone)	1 in 5 patients under 30 years had 24-hour urine analysis
The patient has a strong family history of stones	The presence or absence of a family history of renal stones is not uniformly well-documented on the electronic medical record (so could not be assessed in this retrospective analysis)
The patient has already formed multiple or bilateral stones in one kidney or stones in both kidneys	8/49 (16.3%) of recurrent or bilateral stone formers had 24-hour urine analysis
The patient has specific findings on stone biochemistry (e.g. raised cystine or uric acid)	None of the 16 patients with uric acid or cystine stones had 24-hour urine analysis
The patient has anatomical abnormalities that are likely to cause more stones to form	None of the 4 patients with anatomical renal tract abnormalities had 24-hour urine analysis

Limitations:

- Retrospective data collection project so we were unable to accurately assess family history or other clinical conditions leading to increased risk of renal stone formation
- Unable to assess whether dipstick urine pH had been tested
- Not all patients having stone procedures in theatre have fragments sent (i.e. stone is dusted with laser)

CONCLUSIONS

- At a minimum, we should ensure serum calcium and urate are checked in any patient who formed a renal stone.
- 24-hour urine analysis should be considered in recurrent or high-risk stone formers.
- This audit will help the biochemistry, urology and renal teams improve local practice of biochemical investigations for recurrent stone formers.
- NHS Highland patients with renal stone disease face a unique challenge of geographical distance to travel for treatment and a multidisciplinary approach to investigation and treatment may help identify patients who are at risk of stone recurrence.