Original article

Renal function in men with lower urinary tract symptoms at first presentation to urology out-patient department

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Aim: Current national guidelines state that it is mandatory to perform an estimation of renal function in all males with lower urinary tract symptoms (LUTS). As national audit evidence suggests this is not general practice, we have carried out a study to assess the value of routine testing of renal function in this group.

Patients and Methods: Serum creatinine or urea was measured in 213 consecutive men presenting to the urology out-patient department with lower urinary tract symptoms. Risk factors for renal dysfunction such as large post-void residual volume, proteinuria, microscopic haematuria, diabetes mellitus and cardiovascular disease were noted.

Results: Twelve of 213 patients had abnormal results. One 90-year-old had a raised serum urea but was found to have a normal creatinine level. Ten of the remaining 11 patients would have had their renal dysfunction predicted by history, examination or bedside tests.

Conclusions: Routine measurement of creatinine or urea in men presenting with LUTS with no other risk factors could be considered purely a health screening test. It is suggested that it should no longer be considered as mandatory, in this situation, but used only if specifically indicated. A urine flow rate would be a more useful test in reaching a diagnosis and planning treatment.

Key words: Creatinine – Lower urinary tract symptoms – Renal failure

The British Association of Urological Surgeons (BAUS) and The Royal College of Surgeons of England guidelines on investigation of males with LUTS state that testing the level of serum creatinine or urea in patients presenting with lower urinary tract symptoms is mandatory.¹ This is based on category C evidence, *i.e.* that it is thought to be correct by a body of expert opinion but has not been shown to be conclusively necessary by any randomised control trials or even observational studies.

A retrospective combined analysis of benign prostatic hyperplasia showed that 13.6% of cases (range, 0.3–30%) had renal insufficiency, but this study assessed patients who

actually required treatment². The National Prostatectomy Audit³ found that in nearly half of the cases patients only had creatinine or urea checked either at immediate pre-operative assessment or on acute admission for urinary retention. Indeed, 196 (3.7%) of this study group had neither test prior to transurethral resection of the prostate.

It is generally accepted that high-pressure urine retention can lead to obstructive renal failure,^{4,5} and it is primarily the fear of missing this condition that suggests the need to check renal function in all patients. However, in our practice, it is very uncommon for us to see a patient who presents with LUTS who has not already had a

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Figure 1 Changes in creatinine concentration with age in the study population ($n = 200$). Dotted line indicates $124 \mu\text{mol/l}$, upper limit of normal.

residual urine volume measured before they are seen by a clinician, thus minimising the risk of missing a high-pressure urinary retention. Most urology clinics would now have a urine flow rate and residual urine volume checked as a diagnostic procedure at first assessment.

Previous investigators have found that a history of diabetes mellitus or hypertension is significantly associated with the likelihood of an abnormally elevated serum creatinine measurement.⁶ However, picking up renal problems in these patients is more likely to be related to their pre-existing disease than of diagnostic benefit with regard to their LUTS.

The aim of this study was to determine the value of routine creatinine or urea measurement in men presenting to a general urology out-patient department for the first time with LUTS. It also aimed to ascertain how often it was possible to predict abnormal results from history, examination and bedside tests.

Patients and Methods

Data from 213 consecutive patients presenting with LUTS for the first time to the general urology out-patient clinic of a single consultant were included in the study.

A full urological and medical history was taken with special regard to whether their symptoms were suggestive of high-pressure chronic retention and as to whether there were any risk factors for renal disease, cardiovascular disease or diabetes mellitus.

All patients had at least a post-void residual performed and, where possible, a urine flow rate. A urine sample was dipped and tested for glucose, haematuria and proteinuria. It was noted whether the clinical impression was one of benign or malignant prostatic disease. A blood sample was sent for creatinine or urea measurement. The records were kept on a specially designed data collection sheet and then analysed using spreadsheet software.

Results

Complete data were collected on 213 men from 5 January 2001 to 25 March 2002 of whom 200 had serum creatinine measured and 13 had serum urea measured. The mean age was 66.7 years (range, 25–100 years).

Eleven (5.2%) of the 213 patients had an abnormal creatinine or urea level. (One other 90-year-old patient had a urea level of 7.3 mmol/l when checked by his general practitioner, but subsequently a normal creatinine value of $91 \mu\text{mol/l}$ was determined.) The upper limit of creatinine levels in our laboratory is $124 \mu\text{mol/l}$ and the upper limit of urea levels is 6.6 mmol/l . The mean age of those men with normal creatinine or urea was 66.2 ± 12.0 years; the mean age of those with an abnormal result was 80.0 ± 6.7 years. Figure 1 illustrates the increase in creatinine level with patient age.

Of the 11 men who had abnormal results, only 1 would not have been predicted from their history, examination or bedside tests. This patient suffered with COPD treated with long-term steroids who had a creatinine level of $139 \mu\text{mol/l}$

Table 1 The incidence of various risk factors in the study population

Risk factor	Incidence
Cardiovascular disease	35
Microhaematuria/proteinuria	16
Known or presumed CaP	13
Diabetes mellitus	9
Renal volume > 250 ml	17
Other (arteritis, nephritis/nephrotoxic drug/neuropathology)	6
Known CRF	2

Table 2 Variation of age and creatinine levels with number of risk factors for all patients who had had creatinine measured

	Number of patients	Age (years)	Creatinine (SD) ($\mu\text{mol/l}$)
All patients	200	66.7	101.5 (16.7)
No risk factors	124	64.9	97.8 (11.4)
Any risk factor	76	70.3	107.5 (21.3)
1 risk factor	60	70.9	106.3 (21.3)
2 risk factors	14	69.7	109.2 (18.4)
3 risk factors	2	74	132 (39.6)

and was felt to have a renal cause for his deranged renal function. In no patient was subsequent urological treatment influenced by the abnormal findings.

Eighty patients had risk factors for renal disease; 64 had one risk factor, 14 had two risk factors and 2 had three risk factors (Table 1). It can be seen from Table 1 that cardiovascular disease is by far the most common risk factor for renal dysfunction in this population.

Table 2 shows that patients with no risk factors (mean age, 64.9 years) are younger than those that have risk factors (mean age, 70.3 years). The difference was found to

be statistically significant using Student's *t*-test ($P = 0.002$).

The mean creatinine level ($n = 200$) was $101.5 \pm 16.5 \mu\text{mol/l}$ and mean urea level ($n = 13$) was $5.4 \pm 0.9 \text{ mmol/l}$. Table 2 illustrates how mean creatinine level varies according to the number of risk factors. From Table 2, it can be seen that as the number of risk factors increases so does the mean creatinine level. The mean creatinine level for patients with no risk factors was $97.8 (\text{SD } 11.4) \mu\text{mol/l}$ and the mean creatinine level for patients with any risk factor was $107.5 (\text{SD } 21.3) \mu\text{mol/l}$. Using Student's *t*-test, these were found to be significantly different ($P = 0.0004$).

Figure 2 Serum creatinine changes according to the number of risk factors versus age.

This is further illustrated in Figure 2 when the age and creatinine level according to risk factors are plotted on the same graph.

Discussion

The measurement of serum creatinine or urea is advocated to detect occult renal failure in patients with LUTS. This study shows that abnormalities of these parameters are uncommon in this group, and very rare if no other risk factors are present (1/133). Furthermore, these abnormalities had no impact on the urological management of any patient. Therefore, we feel that these tests should not be regarded as mandatory in the investigation of such patients, but only required if other risk factors are present. It must be remembered that we looked purely at a population presenting with LUTS and not at patients who presented in acute urinary retention.

We certainly agree that detecting treatable causes of renal failure is important, but, in this patient group, the main concern is failure to detect obstructive uropathy which is related to chronic retention. However, using creatinine or urea measurement as a test to avoid missing high-pressure chronic retention is not a fail-safe approach. There is a point during which there is high-pressure retention without impairment of renal function and just testing the renal function will miss this group of patients. Four cardinal features dominated the clinical presentation of high-pressure chronic retention as described by George *et al.*:⁴ (i) late onset enuresis; (ii) a tense, painless bladder; (iii) hydronephrosis or hydroureter; and (iv) hypertension. In this report, of 21 patients, 18 had three or more of these criteria at the time of initial consultation. All 21 patients had a tense, painless bladder that was easily palpable suprapubically. What is also significant is that late onset enuresis and high-pressure retention may be present with only minor symptoms of outflow tract obstruction.⁷

Interestingly, the current BAUS guidelines¹ for the management of lower urinary tract symptoms state that although urine testing for bacteriuria, glycosuria and haematuria are obligatory, measurement of maximum

urinary flow rate and estimation of residual volume by ultrasonography are only strongly recommended. High-pressure chronic retention with impaired renal function has not been described in patients with a residual volume of less than 475 ml.⁸

Conclusions

Routine post-void residual scanning negates the need for the routine measurement of renal function, which is not of additional diagnostic benefit in these patients. If renal function is measured without adequate investigation of other urological symptoms, then measurement of renal function becomes a screening test for a population that just happen to have LUTS.

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