Hyperkalaemia, Renal Failure, and Right-Sided Hydro-Uretero-Nephrosis a Sequel of Intravesical Debris in the Presence of an Indwelling Long-Term Urethral Catheter: Case Report and Review of the Literature.

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Abstract

**Background:**
Common complications associated with the use of long-term urethral catheter include bypassing of the catheter, bleeding, catheter blockage, urinary tract infection, and accidental disconnection of the urinary catheter bag from the urethral catheter.

**Aims:**
To report a case of intravesical debris associated with long-term urethral catheter causing hyperkalemia, hydronephrosis and renal failure.
To review the literature on debris accumulation in renal tract, causing hyperkalaemia and renal failure.

**Case Report:**
A 78-years old man with a long-term urethral catheter was admitted generally unwell and very little urine draining out of his urethral catheter. Results of his initial renal function test confirmed he was in renal failure and his serum potassium was 6.7 m-mol/L and eGFR 37 mls / minute. He was therefore given insulin/dextrose to bring down the serum potassium level to 5.7 m-mol per Litre.
Ultrasound-scan of his renal tract showed right sided hydro-ureteronephrosis, lots of intra-vesical debris (sediments) causing obstruction of the right ureter. It was agreed that a nephrostomy would help improve the renal failure, but in view of copious amount of debris within the bladder perhaps initial bladder wash outs with removal of the debris may be enough to resolve the hydronephrosis.
Bladder wash outs was done which resulted in complete removal of the debris from the bladder and the renal function returned to normal with serum potassium levels returning to 4.0 mmoles and eGFR to > 90 mls / minute the next day without the need for any other treatment. The hydronephrosis resolved.

**Discussion:**
Literature review confirmed that there has never been a report of debris in the urinary bladder causing renal failure, hyperkalaemia and hydro-uretero-nephrosis.

**Conclusion:**
General practitioners should educate their district nurses to provide weekly bladder wash outs for patients with long term urethral catheters in order to avoid the aforementioned complications.
Serum urea and electrolytes with the following results: Sodium 137 mmol/L (normal range 136-145); potassium 6.7 mmol/L (normal range 3.5-5.4); creatinine 150 umol/L (normal range 62-115); urea 28.2 mmol/L (normal range 2.5-6.7); estimated glomerular filtration rate 37 mL/minute (normal range > 60 mL/minute)

Liver function test; the results on the whole were generally normal.

Urine for culture and sensitivity. (The specimen was rejected because of spillage).

He was started on intravenous infusion of normal saline on arrival and upon realisation that he had hyperkalaemia with Serum potassium of 6.7 mmol/l, he was given insulin glucose (20 units of Actrapid in 50 ml of 50% dextrose) which brought down the serum potassium to 5.7 mmol/L. Detailed results of the serum urea and electrolytes after the insulin glucose treatment were recorded as follows: (Sodium 140 mmol/L, Potassium 5.7 mmol/L, Creatinine 122 Umol/L, Urea 23.4 mmol/L; eGFR 46 ml/minute). After he had had 1,500 ml of normal saline he had produced 130 mls of cloudy urine which contained a lot of debris and the urine was bypassing. He was also given 1.2 grams of Co-Amoxiclav intravenously.

An ultrasound scan of renal tract was done and this revealed right sided hydronephrosis (see illustration 1), right hydro-ureter, a thick walled urinary bladder with diverticula, a lot of debris / sediments within the urinary bladder which was blocking the right ureteric orifice, the left upper renal tract was normal with no hydronephrosis (see illustrations 2 and 3 which show the debris in the urinary bladder). In view of the right sided hydronephrosis, renal failure and hyperkalaemia the physicians asked for a urological opinion to see if a right nephrostomy insertion was not indicated to help improve the renal failure.

At a review of the ultrasound scan by the urologist with the radiologists it was felt that the copious amount of debris/sediment in the urinary bladder could possibly be the cause of the renal failure because the catheter was not draining well. It was therefore recommended that: in view of the fact that the serum potassium level had been brought down to 5.7 mmol/L, a bladder wash out should be performed to remove all the debris in the urinary bladder to see if the urine out-put as well the renal function would improve without resorting to insertion of a nephrostomy; a repeat ultrasound scan would be performed the next day as well as a repeat serum urea and electrolyte estimation.

A bladder wash out was attempted through the indwelling 16 Fr urethral catheter but it was realised that the catheter was blocked by debris and that normal saline could not flush through. The 16 Fr catheter was removed and a 22 Fr 3-way urethral catheter was inserted through which a thorough bladder wash outs was done removing a lot of debris pursuant to which the urine became clear and the urine output improved with a drainage of clear urine.

A repeat ultrasound scan which was performed the next day (about 15 hours after the bladder wash outs) revealed complete resolution of the hydronephrosis (see illustration 4). The patient had serum urea and electrolytes repeated 1 day and 2 days after the bladder wash outs and the results showed that the renal function had completely returned to normal with all parameters of his renal function being normal including the estimated glomerular filtration rate (eGFR) which had improved to > 90 ml/min. The detailed results of the patients renal function tests after the bladder wash outs were recorded as:

Day 1 post bladder wash-outs- Sodium 136 mmol/L; Potassium 4.0 mmol/L; Creatinine 69 U mol/L; Urea 11.0 mmol/L; eGFR > 90 ml/minute.

Day 2 post bladder wash-outs- Sodium 138 mmol/L; Potassium 4.1 mmol/L; Creatinine 63 U mol/L; Urea 4.7 mmol/L; eGFR > 90 ml / minute.

His serum Prostate Specific Antigen was recorded as 2.06 ug / litre (within normal range).

The patient was subsequently discharged home after the 3-way urethral catheter was replaced with a new 2-way long-term urethral catheter, with recommendations to his general practitioner and the district nurse to perform bladder wash outs for patient once a week to avoid further accumulation of debris in the patients urinary bladder in the future

**Discussion**

There are number of well known and common causes of hydro-ureteronephrosis however, intra-vesical or intra-ureteric debris is not one of them. Gordon and associates [1] reported a 9-years-old girl who presented with apparent meningococcal septicaemia and developed acute renal failure after 48 hours of treatment with antibiotics and analgesics. Early ultra-sound scanning, demonstrated mild bilateral hydro-uretero-nephrosis and no contrast entering the urinary bladder. Repeat ultra-sonography revealed bilateral papillary irregularity and echogenic debris in the distal ureter. Bilateral double –J stents were inserted cystoscopically, resulting in prompt polyuria and return of normal renal function. Gordon and associates [1] concluded that although rare, recognition of slough papilla in papillary necrosis causing ureteral obstruction can lead to early

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management with no long term sequelae. Broadis and associates [2] reported a 2-year-old male who was brought to hospital with a 5 day history of vomiting and pyrexia. He was initially treated with non-steroidal medication as an antipyretic. Initial investigations demonstrated raised serum urea and creatinine and he was treated with intravenous fluids. Within 24 hours he became anuric with progressive renal insufficiency. Ultra-sound scan demonstrated minimal bilateral hydronephrosis with debris in the lower pole calyces. The urinary bladder was empty. Cystoscopy and retrograde contrast imaging revealed bilateral ureteric obstruction. Double J stents were inserted and his renal function returned to normal within 4 days. Broadis and associates [2] stipulated that the aetiology to the renal papillary necrosis and bilateral ureteric obstruction was secondary to the administration of ibuprofen in association with dehydration.

Kamath and associates [3] reported an unusual case of a sloughed papilla causing hydronephrosis of a transplant kidney and its successful percutaneous removal. They stated that the recognition of renal papillary necrosis is important, not only because it can lead to obstruction, infection, and potentially the loss of the transplant. They also stated that papillary necrosis as a cause of obstruction in a transplant patient is extremely rare with only one reported case prior to their report.

Amuluru and associates [4] reported a case of a patient who developed bilateral hydro-uretero-nephrosis from papillary necrosis secondary to ingestion of commercial toilet bowel cleaner eight days after her ingestion. Acute renal failure prompted a renal ultrasound which showed bilateral hydro-uretero-nephrosis. Emergent bilateral per-cutaneous nephrostomy tubes were placed and subsequent ureteroscopy revealed a large amount of obstructing necrotic material consistent with papillary necrosis. Ureteroscopic removal of the material and bilateral ureteral stents improved the patient’s renal function. They stated that:

The aetiology of the patient’s papillary necrosis was likely due to a combination of hypovolaemia, systemic acidosis from the ingestion, and direct toxicity of the substance on the renal vasculature.

This case demonstrates the importance of early recognition of renal insults and the extra intestinal manifestation of toxic household ingestions.

Debris building up within the urinary bladder is one of the main problems encountered by patients undergoing long-term catheterization. Common problems that have been reported by patients with long-term urethral catheter in the urinary bladder associated with debris include: by passing of urine around the catheter; intermittent blockage of the catheter requiring more frequent changes of the urinary catheter, a single episode of acute retention of urine and no drainage from the catheter requiring admission to hospital for change of catheter and bladder wash outs; recurrent urinary tract infections and smelly urine associated with bypassing of urine around the catheter; observation of lots of debris in the urinary catheter requiring a request to the district nurse and general practitioner for more frequent bladder wash outs; frequent bypassing of urine around the catheter and debris in the urine but the district nurse only comes to change the catheter without wash outs and the catheter blocks again. When patients are discharged from Urology units arrangements are usually made with the district nurses working with the patients’ general practitioners to do bladder wash outs for the patients once a week and in cases of excessive debris within the bladder to do bladder wash outs twice a week; and the urinary catheters should be changed every 12 to 13 weeks. Occasionally patients come back to say that they have not been having bladder wash outs as advised.

There is evidence in the literature [1, 2, 3, 4], to suggest that debris from renal papillary necrosis can cause ureteric obstruction and renal failure. To the author’s knowledge there is no report of debris in the urinary bladder accumulating to the extent of causing hydro-uretero-nephrosis associated with renal failure and hyperkalemia requiring treatment with insulin and glucose to bring the serum potassium levels down to normal range and to warrant consideration for insertion of per-cutaneous nephrostomy. This is the first reported case of significant debris in the urinary bladder in association with an indwelling blocked urethral catheter causing ureteric obstruction, renal failure and severe hyperkalaemia. Recognition of the debris in the bladder which was considered to be the cause of the obstruction enabled the patient’s doctors to change the urethral catheter to a 3-way 22 French catheter which made it easy for a thorough bladder wash outs to be provided and this management was enough to ensure complete removal of all the debris from the urinary bladder as well as resolution of the hydronephrosis in less than 24 hours with resolution of the renal failure (thus avoiding the need for insertion of nephrostomy).

**Conclusion**

The experience gained by the knowledge that accumulation of significant debris in the urinary
bladder can lead to hydronephrosis, infection, renal failure and hyperkalaemia should be enough for all general practitioners to educate their district nurses to provide weekly bladder wash outs to their patients with long term catheters to avoid the aforementioned complications.

References

Illustrations

Illustration 1

Illustration 1: Ultra-sound scan showing right-sided hydrenephrosis

Illustration 2

Illustration 2: Ultrasound-scan showing debris (sediments) in the urinary bladder
Illustration 3

Illustration 3: Another view of the ultrasound-scan showing debris (sediments) in the urinary bladder and dilatation of the ureter at the right vesico-ureteric junction

Illustration 4

Illustration 4: Ultra-sound scan done the next day after bladder wash-outs via a 22 French 3 way urethral catheter showing complete resolution of the right previous right-sided hydronephrosis (All the debris in the urinary bladder had been completely removed at the end of the bladder wash outs).
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