

V Edition of the Clinical Cases Contest on  
non-surgical clinical management of Kidney Stones  
*Official template*

**Title:** Use of Canoxidin to prevent complications and additional procedures due to Single J catheter encrustation: A case report

**Author:** Alberto Adriazola Martín

**Affiliation 1st author:** Hospital Universitario Puerta de Hierro Majadahonda

**Key words:** encrustation, single J catheter, canoxidin, urinary pH

## 1. Abstract

Catheter encrustation and urinary infections are common complications, especially in patients with long-term use. We present a case of an 80-year-old man with many comorbidities and history of a cystoprostatectomy and Bricker-type urinary diversion who developed stenosis of the left uretero-ileal anastomosis. It is managed with regular replacements of single J catheter every three months. After missing one follow-up appointment, catheter single J encrustation was established with impaired renal function associated. Extra procedures were needed in order to replace the catheter.

The aim of this study is to propose the use of Canoxidin in patients with indwelling single J catheters due to the important complications and extra procedures to be made if catheter cannot be replaced.

## 2. Introduction

For a long time, double-J and single J ureteral catheters have been used by urologist. They were introduced more than 40 years ago and widely used for managing urinary obstructions, facilitate ureteral dilation, and prevent occlusion after endourological procedures or reconstructive surgeries. While they are highly effective, up to 80% of patients experience complications, with the most common being discomfort or hematuria. However, more severe issues can arise, such as urinary tract infections, encrustation, chronic obstruction, and renal damage (1). Encrustation involves the deposition of crystals on the stent surface, which, in severe cases, can lead to complete catheter blockage, stent rupture, ureteral damage, or even loss of kidney function.

Stent encrustation develops in multiple stages. Newer studies highlight the greater importance of urine pH and the conditioning film. Elevated urine pH encourages the formation of calcium and magnesium phosphate crystals such as hydroxyapatite and brushite (2). Bacterial presence is another factor that raises the risk. Lowering urine alkalinity and boosting the excretion of crystallization inhibitors could help reduce the risk of stent blockage.

Canoxidin is the first product designed to prevent issues associated with long-term use of urological medical devices. It is a formulation combining L-methionine, phytate, and theobromine. Its action modifies urinary conditions that promote stone formation, offering an effective solution to reduce complications associated with these medical devices.

Each component has a unique function:

- L-Methionine: Acidifies urine and counteracts the alkalinity caused by the activity of urease-positive bacteria (3).
- Phytin: Inhibits the crystallization of calcium and magnesium, preventing the formation of alkaline-associated crystals such as brushite, hydroxyapatite, and struvite (4).
- Theobromine: Specifically prevents the crystallization of uric acid, reducing the formation of uric acid deposits (4).

Approximately 50% of patients with chronic indwelling catheters encounter catheter blockage at some point, while a subset of these individuals suffers from rapid and recurrent obstruction (6).

### 3. Clinical Case description

#### 1. Patient information / Medical records

This case involves an 80-year-old diagnosed in 2020 with metastatic small cell lung cancer (SCLC) and treated with chemotherapy and immunotherapy. From a urological perspective, the patient has a history of urothelial carcinoma, treated in 2005 with a radical cystoprostatectomy and Bricker-type urinary diversion. Following the surgery, the patient experienced recurrent infections and stenosis of the left uretero-ileal anastomosis, which required reintervention.

In 2020, the patient experienced recurrent urinary tract infections and left flank pain. Imaging revealed left ureterohydronephrosis due to a new stenosis of the uretero-ileal anastomosis. Initially, a left nephrostomy was placed, confirming a distal stenosis with no passage of contrast into the Bricker loop.

Subsequently, balloon dilation of the stenosis was performed, followed by the placement of an anterograde single J catheter. Due to the persistence of the stenosis despite these procedures, the patient has been managed since 2020 with regular single J catheter replacements.

The patient was admitted, in February 2024, due to poor pain control in the context of a vertebral fracture, lung cancer progression and worsening renal function on top of his chronic kidney disease. The last catheter replacement had been performed six months ago, as the patient missed the follow-up appointment.

#### 2. Diagnostic support studies and results

	Oct 2023 (replacement)	Dec 2023	Jan 2024	Jan 2024	Feb 2024 (Hospitalization)	Feb 2024 (catheter removal)
Creatinine (mg/dl)	1,53	2,1	2,27	2,45	2,51	3,36
Glomerular filtration rate (mL/min/m <sup>2</sup> )	42,6	29,1	26,5	24	23,3	16,3
Urinary PH	7.0	7.5	7.5	-	8	-

Table 1. Serum Creatinine, glomerular filtration rate and urinary ph evolution.

### 3. Diagnosis

During his hospitalization, attempts to replace the single J catheter were made twice without success due to proximal calcification. When the catheter was removed, numerous tiny stone-like deposits (microliths) were found, fully blocking the catheter. The patient was left without a catheter to assess the situation, and a progressive worsening of renal function was observed.



Image 1. Attempt to replace single J catheter. No contrast reaching the kidney due to catheter blockage. Contrast block in middle-proximal ureter.

### 4. Treatment

At this point, we were talking about a patient with lung cancer in progression who had progressive worsening of renal function due to the catheter incrustation and impossibility to replace it.

After evaluating therapeutic options and benefits, it was decided to proceed with a new nephrostomy placement. During the procedure an anteropgrade pyelogram was perform observing persistence left uretero-ileal stenosis.



Weeks after, a new single J catheter was correctly placed and nephrostomy was removed. At that moment, we decided to initiate Canoxidin every 12 hours and continue with periodic single J catheter replacement every three months.

### 5. Evolution and progress

In the following months, the patient did not have any urological problems due to the catheter or urinary infections. Next catheter replacement was successfully completed without any complications. The patient continued with canoxidin every 12 hours.

Months later, the patient passed away due to multiple complications caused by lung cancer.

	Feb 2024 (after nephrostomy)	Mar 2024 (start of canoxidin)	July 2024
Creatinine (mg/dl)	2,19	2,31	2,23
Glomerular filtration rate (mL/min/m <sup>2</sup> )	27,4	25,7	26,8
Urinary PH	7.5	7.5	6.0

**Table 2.** Serum Creatinine, glomerular filtration rate and urinary ph evolution after procedures and canoxidin

### 6. Clinical results

By introducing canoxidin, we might have avoided more problems due to catheter encrustation and if it had been initiated earlier many procedures would have not been necessary.

Unfortunately, we were unable to complete a thorough follow-up due to complications from lung cancer.

### 4. Discussion

Usage of catheters, such as double J, single J, or Foley catheters, is widespread in clinical practice due to their diverse applications in managing various urological conditions. However, with the increasing use of these devices comes a rise in associated complications. One of them is catheter calcification, which can lead to encrustation, obstruction, and the need for invasive interventions.

Currently, there are limited studies on the prevention of catheter calcification. However, the available research suggests that canoxidin, a formulation made up of L-methionine, phytates, and theobromine, shows promising results. This agent has demonstrated a significant reduction in both the percentage of patients who develop catheter calcification and the severity of calcification itself. A noteworthy study by Torrecilla et al. (7) reported that the use of canoxidin reduced catheter calcification by up to eight times compared to the control group. Another recent study by Borau A, et al (6) confirmed the results in a randomized double-blind trial.

Additionally, the use of canoxidin demonstrated a reduction in urinary pH, highlighting its protective effect against catheter calcification.

Despite these encouraging findings, more robust research is necessary to confirm the benefits of canoxidin. Studies with greater statistical power, including larger patient populations and randomized controlled trials, are required. Additionally, research should focus specifically on the use of canoxidin in patients with single J and double J catheters to validate its efficacy in preventing encrustation and reducing the need for invasive procedures.

In our patient's case, missing a single appointment led to multiple complications with his catheter, ultimately requiring additional procedures for its replacement. Nowadays, as the population is increasing, more patients requiring long-term catheterization will be attended and the need to manage complications like encrustation will be pressing. Having an innovative tool like canoxidin to prevent catheter encrustation is a game-changer globally in urology care.

## 5. Conclusions and recommendations

Despite these encouraging findings, more robust research is necessary to confirm the benefits of canoxidin. Studies with greater statistical power, including larger patient populations and randomized controlled trials, are required. Additionally, research should focus specifically on the use of canoxidin in patients with single J and double J catheters to validate its efficacy in preventing encrustation and reducing the need for invasive procedures.

In our patient's case, missing a single appointment led to multiple complications with his catheter, ultimately requiring additional procedures for its replacement. Nowadays, as the population is increasing, more patients requiring long-term catheterization will be attended and the need to manage complications like encrustation will be pressing. Having an innovative tool like canoxidin to prevent catheter encrustation is a game-changer globally in urology care.

## 6. Bibliographic references (\* of special interest, \*\* of extraordinary interest)

1. \* Zumstein V, Betschart P, Albrich W, Buhmann M, Ren Q, Schmid H, et al. Biofilm formation on ureteral stents - Incidence, clinical impact, and prevention. *Swiss Med Wkly*; 2017. p. 1–10.
2. Nicolle, L.E. Catheter associated urinary tract infections. *Antimicrob Resist Infect Control* **3**, 23 (2014).
3. Siener R, Struwe F, Hesse A. Effect of L-Methionine on the Risk of Phosphate Stone Formation. *Urology*. 2016 Dec;98:39-43.
4. Grases F., Ramis, M., Costa-Bauza, A. Effects of phytate and pyrophosphate on brushite and hydroxyapatite crystallization – Comparison with the action of other polyphosphates, *Urol. Res.* 2000, 28, 136–140.
5. Grases F, Rodríguez A, Costa-Bauza A. et al. Theobromine inhibits uric acid crystallization. A potential application in the treatment of uric acid nephrolithiasis. *PLoS ONE* 9(10): e111184.
6. \*\* Borau A, Amaya E, Delía P, Alves MJ, Morcillo M, Ustrell A, Opisso E. Single-center, double-blind, randomized, placebo-controlled pilot study of Canoxidin® for prevention of catheter encrustation in patients with indwelling catheters. *Actas Urol Esp (Engl Ed)*. 2024 Nov;48(9):658-664. English, Spanish. doi: 10.1016/j.acuroe.2024.06.004. Epub 2024 Jul 1. PMID: 38960062.
7. \*\* Torrecilla, C., Fernández-Concha, J., Cansino, J.R. *et al.* Reduction of ureteral stent encrustation by modulating the urine pH and inhibiting the crystal film with a new oral composition: a multicenter, placebo controlled, double blind, randomized clinical trial. *BMC Urol* **20**, 65 (2020). <https://doi.org/10.1186/s12894-020-00633-2>