4th Edition of the Clinical Case Contest related to the non-surgical clinical management of renal lithiasis.

Official template

Title: Alkalinizing treatment and urinary pH control to prevent endourological stent encrustation. A case report.

Key words (between 3 and 6): Stent. Ureter. Endourological. Urinary pH. Lit-Control.

1. Abstract

We present the case of a man with a history of lithiasis treated with several percutaneous and endourological interventions who presented extensive critical ureteral stenosis. Allium© self-expanding stent was placed to correct the obstructive uropathy and voiding symptoms. Maintaining the patency of the stent with urinary alkalinization through pharmacotherapy and dietary recommendations. She maintains stability of her underlying pathology, with no adverse effects, with good tolerance and adherence to treatment.

2. Introduction

Allium's© self-expandable ureteral stents have been designed for temporary short or long term placement in chronic benign or malignant ureteral strictures. We propose their use in a critical stenosis of the proximal ureter with the aim of prolonging the replacement of conventional catheters and reducing the urinary incontinence of urgency reported by the patient. To this end, good stent maintenance is essential, the main pillar of which is based on maintaining urinary pH between 6-7. For this purpose, we use alkalinizing medical treatment with Lit Control® pH Up.

3. Description of the clinical case:

a. Relevant background

A 64-year-old man with a history of calcium oxalate monohydrate lithiasis (Whewellite) treated with different lines of treatment such as: extracorporeal shock wave lithotripsy, ureteroscopy and retrograde intrarenal surgery. As a consequence, he presents a critical stenosis of approximately 4cm in left proximal ureter, so he requires an endopyelotomy catheter since April 2021, performing periodic replacements. Since its placement, she refiere significant emergency urinary incontinence (UUI), which affects her quality of life.

b. Diagnosis support studies and results

The patient was under follow-up in specific lithiasis consultations, where the following

complementary tests were requested:

- Sediment and systematic urine (to highlight): pH between 6- 6.5 with alkalinizing treatment since January 2017, pH at the beginning of treatment of 5. In addition, he presents, 30-50 leukocytes per field, microhematuria and positive nitrites.

- Systematic blood tests (to highlight): renal function, sodium and potassium in normal range, without leukocytosis or elevation of acute phase reactants.

- Abdominal-pelvic X-ray (Rx) in standing position: endopyelotomy catheter with proximal loop on silhouette.

- Abdomino-pelvic computed tomography (CT) without and with intravenous contrast and excretory phase: left kidney of normal size and morphology. Dilatation of the excretory tract persists, with a pelvis of 4cm of antero-posterior diameter (similar to previous CT). The rest of the ureteral tract remains discreetly ectatic until the lumbar ureter where it presents an extensive sharpening up to practically the ureterovesical junction. There is no evidence of lithiasis.

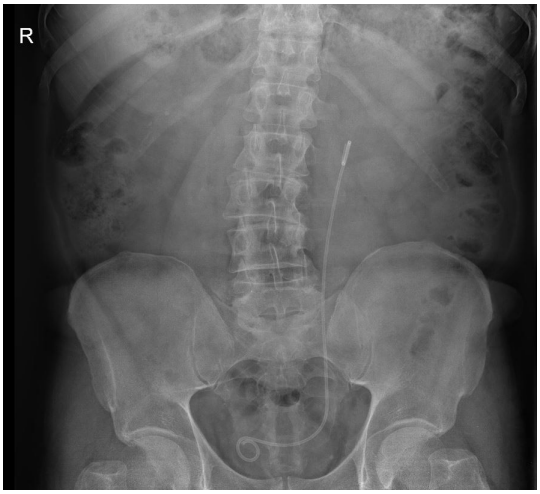

Fig. 1: Abdominal X-ray: double J catheter with proximal loop over left renal silhouette and distal loop over bladder silhouette.

Fig. 2. CT with 3D reconstruction showing marked dilatation of the left renal pelvis.

c. Diagnosis

Given the persistence of a critical stenosis of approximately 4 cm in length in the left proximal ureter with progressive worsening of renal function and severe urinary incontinence secondary to the endopyelotomy catheter, it was decided to place a self-expanding stent.

d. Treatment

Prior to surgery, a dose of preoperative antibiotic prophylaxis was administered and the patient was placed in the lithotomy position under general anesthesia. An initial cystoscopy was performed, with no relevant findings. Subsequently, the semi-rigid ureterorenoscope (URS) was used to approach the left ureteral orifice with prior insertion of a safety guide. To locate and determine the length of the stricture, retrograde pyelography was performed through the working channel of the URS. The existence of a critical stenosis of approximately 4 cm in the left proximal ureter without the presence of associated lithiasis was confirmed. Under fluoroscopic control and after dilatation with a high pressure balloon, an Allium 30F ureteral stent, 120mm long, was inserted. 30F ureteral stent of 120mm length was inserted.

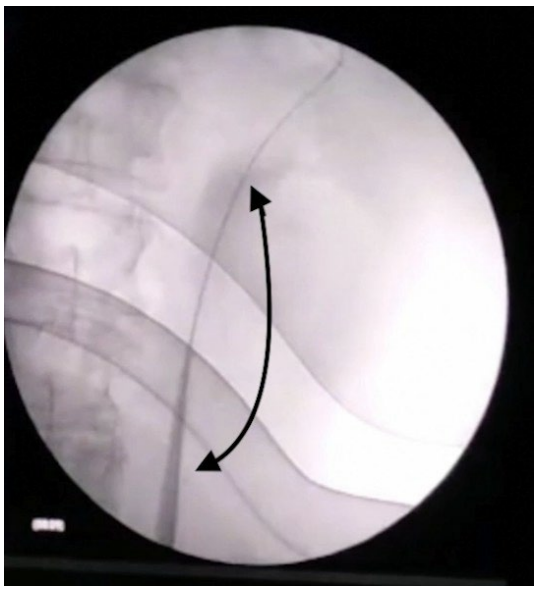

Fig. 3. Left ascending ureteropyelography showing stenosis of the proximal ureter and passage of the sensor guidewire to the renal unit.

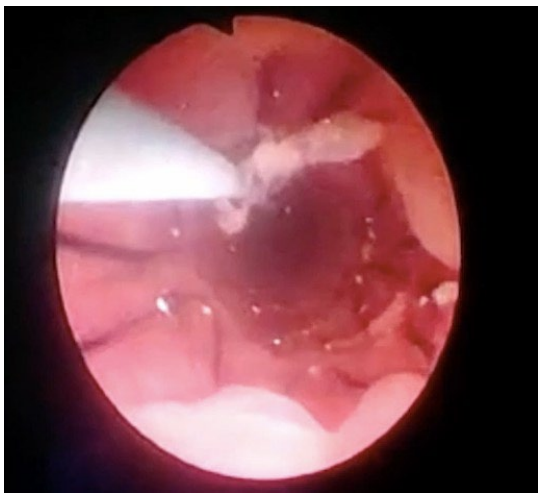

Fig. 4. Endourological view of ureteral stent and sensor guidewire.

After 24 hours postoperatively, a normal blood and radiographic control is performed. In case of good tolerance to the catheter and absence of signs of complications, the patient is discharged home.

Fig. 5. Abdominal pelvic X-ray in standing position showing an expanded stent over the left ureteral

tract.

e. Evolution and follow-up

Serial controls were performed in outpatient clinics, the first one month after the intervention, where the pH level was around 7, so treatment was started with Lit Control® pH Up. The patient was instructed in the home use of Lit-Control® pH Meter to maintain a strict control of urinary pH between 6-7 values and to be able to make modifications in his usual dosage. The controls were spaced every 3-4 months with urinary pH control, abdomino-pelvic X-ray to assess the correct positioning of the stent and renal ultrasound in consultation to rule out the presence of renal ectasia. After 11 months of follow-up, slight calcification of the proximal end with pH slightly above 7 was observed. The dosage of the alkalinizing medical treatment was modified with radiological improvement of the described calcification, maintaining urinary pH at normal values.

f. Clinical results

After 16 months of treatment the patient presents good tolerance to the catheter, without urgency urinary incontinence and with the following complementary tests:

- Systematic blood analysis (to highlight): renal function, sodium and potassium in normal range, without leukocytosis or elevation of acute phase reactants.

- Urinalysis and sediment (to highlight): pH 7.

- Abdominal pelvic X-ray: stent normo positioned and correctly expanded, with minimal calcification of the proximal end, less than previous X-ray.

- Abdominal pelvic CT without contrast, with contrast and in excretory phase: left kidney minimally congestive and with a decrease in the number and size of known lithiasis formations, currently there are two punctiform lithiasis and one of 3mm in lower caliceal groups. The left ureteral stent holder is well expanded and with two calcific formations in its proximal end and another distal one. Significant inflammatory changes surrounding the renal pelvis and proximal ureter persist; no major changes.

Fig. 6. CT with 3D reconstruction showing a correctly expanded left ureteral stent.

4. Discussion

With the increase in the number of endourological interventions, ureteral stricture is an increasingly prevalent disease in our environment. It can be secondary to benign processes such as urolithiasis, retroperitoneal fibrosis, iatrogenic lesions; as well as malignant processes such as retroperitoneal, gynecological, prostate, colon or stomach tumors, among other causes. Its morbimortality increases when it is associated with loss of renal function secondary to obstruction of the affected renal unit. In these cases, the most commonly used treatment is endourological with the placement of a double J catheter (JJ) (1). Other treatment alternatives are endoureterotomy, ureterolysis, ureteral balloon dilatation and insertion of metallic or indwelling catheters, to be assessed individually in each case. There are also reconstruction techniques that involve major surgical interventions, such as stricture resection and end-terminal anastomosis, ureteroneocystostomy, transureteroureterostomy and pyeloplasty in proximal strictures, among others.

Although in our environment the most commonly used treatment for ureteral strictures is the placement of a JJ catheter, this has a series of associated complications such as incrustation, dysuria, lumbar pain, pollakiuria and obstruction of the catheter. Therefore, in recent years the industry has focused on developing other products to reduce these complications (2). Recently, the placement of the self-expandable ureteral stent Allium©, has burst onto the endourology market as an effective and safe treatment alternative, with favorable prospective results (3, 7).

This stent has a self-expandable metal body with an elastic nickel-titanium alloy coated with a biocompatible polymer to prevent tissue growth and encrustation. Patency rates are high (>95%), although follow-up in series to date does not exceed 2 years (4). The main drawbacks include recurrent urinary tract infections, encrustation, the need for replacement and irritative voiding symptoms such as dysuria, pollakiuria and lumbar discomfort. Incrustation is based on the deposit of mineral crystals on the

surface and lumen of a ureteral stent (6). This can create serious problems, especially for permanent stents, as they become brittle and lose their tensile strength. This increases the risk of stent fracture or ureteral avulsion during stent replacement or removal, usually requiring re-interventions (6). The main risk factors described in the literature on ureteral catheter encrustation conclude that it is a complex and multifactorial process (6,8). The patient's own risk factors, the stent material used and the formation of biofilms play an important role (8). Stent encrustation is catalyzed by the presence of urease-producing organisms (Proteus, Pseudomonas, etc.) which cleave urea into ammonia, raising the urine pH and producing struvite precipitation on the catheter surface (6). Therefore, one of the options described in the literature to favor the prevention of encrustation in long-duration stents is to raise the urinary pH (6). According to the literature review, there is no standard follow-up protocol established for patients after stent placement. However, all the groups that use this technique perform follow-up with imaging tests such as abdomino-pelvic X-ray to rule out catheter migration, abdomino-pelvic ultrasound to control stent patency to rule out renal ectasia, blood and urine analysis to assess renal function and urinary pH.

5. Conclusions and recommendations

Self-expandable ureteral stents are an effective and safe alternative for ureteral strictures requiring an indwelling endourological catheter. They do, however, require strict control of urinary pH for proper maintenance over the years. The aim is to avoid incrustations and to maintain their permeability. For which it is essential to use urinary pH meters by the patient, such as Lit Control® pH Meter. Depending on the need for acidification or alkalinization of urinary pH, use Lit Control® pH Down or Up. Patients benefit from having a long-term catheter with pH controls as opposed to periodic changes every 5-6 months of catheters with a higher probability of calcification and associated complications.

6. Bibliographical references (*of special interest, **of extraordinary interest)

**1.- Aksakalli, S. Adanur, S.O. Demirdogen et al., Stent ureteral Allium®: una nueva alternativa para el tratamiento de estenosis ureterales. Estudio prospectivo de cohortes, Actas Urológicas Españolas, https://doi.org/10.1016/j.acuro.2023.05.008

2.- Lucas J.W., Ghiraldi E., Ellis J., Friedlander J.I.: Endoscopic management of ureteral strictures: An update. Curr Urol Rep. 2018; 19: pp. 24.

3.- Paffenholz, Pia[a]; Heidenreich, Axel[a,b]. Modern surgical strategies in the management of complex ureteral strictures. Current Opinion in Urology 31(2):p 170-176, March 2021. | DOI: 10.1097/MOU.0000000000000849 *

4.- Kachrilas S, Bourdoumis A, Karaolides T, et al. Current status of minimally invasive endoscopic management of ureteric strictures. Therapeutic Advances in Urology. 2013;5(6):354-365. doi:10.1177/1756287213505671*

5.- Tartaglia N, Salvitti M, Caliolo C, Petrucci F, Franco G, De Dominicis C, Leonardo C

Utilization of Allium Ureteral Stent in the Endoscopic Treatment of Ureteral Stenosis: Our Experience and Preliminary Results. Urology, 2011, 78(3), S185 | added to CENTRAL: 31 December 2014 | 2014 Issue 12

*6.- Tomer N, Garden E, Small A, Palese M. Ureteral Stent encrustation: Epidemiology, pathophysiology, management and current technology. J Urol [Internet]. 2021;205(1):68–77.

7.- Mosayyebi A, Manes C, Carugo D, Somani BK. Advances in Ureteral Stent Design and Materials. Curr Urol Rep. 2018 Apr 10;19(5):35. doi: 10.1007/s11934-018-0779-y. PMID: 29637309; PMCID: PMC5893657.

*8.- Kram W, Buchholz N, Hakenberg OW. Ureteral stent encrustation. Pathophysiology. Arch Esp Urol. 2016 Oct;69(8):485-493. English. PMID: 27725325.

9.- Sampogna G, Grasso A, Montanari E. Expandable metallic ureteral stent: indications and results. Minerva Urol Nefrol. 2018 Jun;70(3):275-285. doi: 10.23736/S0393-2249.18.03035-7. Epub 2018 Mar 28. PMID: 29595037.