Efficacy of the Endoscopic Combined Intrarenal Surgery for the Treatment of a Staghorn Calculus in Crossed Fused Renal Ectopia

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Abstract

Background: Crossed fused renal ectopia (CFRE) is an unusual anomaly in which both kidneys lie fused on one side, with double pelvis and ureters draining into both sides of the bladder. Complex renal stones are a considerable challenge to endourologists, and when a staghorn stone is associated with abnormal anatomy, its treatment is even more difficult. Today there is no consensus about the right treatment for complex renal stones in CFRE. So, the objective of this case is to present the efficacy of the endoscopic combined intrarenal surgery (ECIRS) for the treatment of a staghorn renal stone in one patient with CFRE.

Case Presentation: We described a case of a 23-year-old man with prolonged lasting and pain on the left flank associated with intermittent gross hematuria. Enhanced CT revealed a crossed fused kidney on the left side, drained by an intercommunicating pelvis and a single ureter, with a staghorn stone wholly occupying both renal units. The patient was effectively treated by one single session of ECIRS.

Conclusion: The ECIRS is a good alternative to consider in patients with CFRE that have a staghorn calculus with a reasonable success rate.

Keywords: endourology, crossed fused kidney, endoscopic combined intrarenal surgery, percutaneous nephrolithotomy, kidney stones

Introduction and Background

CROSSED FUSED RENAL ECTOPIA (CFRE) is the second most common congenital abnormality just after horseshoe kidney, with an incidence of 1:1300 to 1:7500. In CFRE, one kidney crosses the midline to the opposite side of the spine, and the ureter of the crossed ectopic kidney crosses the midline and enters the bladder at its orthotopic position.¹

Percutaneous nephrolithotomy (PCNL) is the gold standard treatment for >2 cm renal stones, with a success rate ranging from 25% for the more complex stones and >90% for the less complicated stones, and of the main prognostic factors that influence the stone-free rate in renal anatomy. Therefore, it is expected that a staghorn calculi together with abnormal anatomy like a crossed fused kidney has the worst success rate, representing a real challenge for its treatment.

The purpose of this case is to present the safety and efficacy of endoscopic combined intrarenal surgery (ECIRS) for the treatment of a complete staghorn stone in a patient with CFRE.^{1,2}

Case Presentation

A 23-year-old male with mild, intermittent, and chronic pain in his left flank and gross hematuria presented to the emergency department on two different occasions. The patient was otherwise healthy, with a body mass index of 25.4 kg/m² and no history of previous illness. There was no significant findings on physical examination except tenderness on deep palpation of the left flank. The urine test confirmed hematuria, with 50 erythrocytes per high-power field and the renal function was preserved.

A contrast-enhanced CT scan showed a staghorn calculus (837 HU) in a crossed fused kidney on the left side, with an

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intercommunicating pelvis drained by a single ureter. The vascular supply of the crossed kidney consisted of one renal artery arising from the right common iliac artery and the artery from the orthotopic kidney emerged directly from the aorta (Fig. 1).

We completed the preoperative protocol obtaining a negative urine culture before performing the stone removal. The procedure was carried out under general anesthesia and with the patient in the Galdakao-modified supine position.² Retrograde flexible ureteroscopy was performed to check the anatomy of the ureter, the ureteropelvic junction, the collecting system, and to guide the percutaneous access (with no success in this case because the stone was entirely adherent for both renal pelves).

Renal access was with our simplified 0–90° fluoroscopic puncture technique.³ We made two percutaneous punctures, one through the lower pole calix (native kidney) and the second access through the central region of the calix in the fused kidney (Fig. 2). For both tracts, we used the “one-shot” dilatation method with two 24F Amplatz sheaths. We used the Karl Storzä MIP-L nephroscope. Lithotripsy was performed with the Lithoclast from EMSTM combined with the 100 W

holmium: YAG laser device by LumenisTM. Retrograde access was performed using an 11/13F ureteral access sheath and the Flex-X2 scope from Karl StorzTM. The total operative time was 155 minutes, with an overall fluoroscopy screening time of 34 seconds, being a tubeless procedure with a Double-J stent inserted retrogradely.

A complete retrograde and antegrade flexible nephroscopy of the collecting system was performed at the end of the procedure to evaluate for residual stones, and we observed no residual fragments. The patient's postoperative course was uneventful, and the postoperative CT performed after 24 hours showed a complete absence of residual stone fragments (Fig. 3). The patient was discharged home on the day after the procedure without complications. Finally, we removed the Double-J stent 1 week after the procedure by flexible cystoscopy.

Discussion and Literature Review

In 2008 the ECIRS acronym was coined by Scoffone et al. for the description of the ECIRS. Even though ECIRS was first described in the supine position, today this acronym is

FIG. 1. (A) 3D reconstruction showing just a complex staghorn calculus with separated fragments in upper and lower pole calices. (B) 3D reconstruction of the urinary collecting system that shows the two pelves fused to just one single ureter that drains in the bladder. (C) Angiotomography reconstruction that shows the vascular supply of both renal units (the crossed kidney has one renal artery that arises from the right common iliac artery, and the orthotopic kidney has one renal artery that arises from the aorta) and (D) CT coronal reconstruction.

FIG. 2. (A) Fluoroscopic perioperative images, with one percutaneous tract for each renal unit and the retrograde renal access (endoscopic combined intrarenal surgery). (B) Control retrograde pyelography picture at the end of surgery.

used by surgeons performing PCNL in the supine and prone position. This combined endoscopic approach has the main advantage of double simultaneous access to the renal collecting system and is especially helpful for the most complex cases of renal stones with abnormal renal anatomy like the CFRE.²

Treatment of complex renal stones is a real challenge with higher complication and retreatment rates. Currently, there is

no established consensus about the adequate treatment of renal stones in abnormal renal anatomy. Rana and Bhojwani reported 48 patients with renal stones and renal anomalies (fusion, ectopia, rotation, hypoplasia, and pelvicaliceal aberration) treated with PCNL. They reported a high stone-free rate (81%) after one single session for stones with a mean size of 39 mm and concluded that PCNL is a comprehensive procedure for renal stones with a mean stone size of 39 mm in kidneys with abnormal anatomy.

In our case, the anterograde and retrograde combined approach (ECIRS) was effective for the treatment of a complete staghorn stone in a patient with CFRE. Using a combined approach, we could get a complete stone clearance in one single session. An essential consideration for ECIRS in CFRE is the possibility of a failed retrograde approach because of the problematic anatomy, so we recommend a flexible nephroscope to perform an exhaustive renal collecting system revision. In addition, nowadays, there is no consensus about the treatment of noncomplex renal stones in kidneys with abnormal anatomy. Flexible ureteroscopy and minipercutaneous nephrolithotomy could be indicated in those patients with stones <2 cm.⁴

In the absence of an established consensus and based on our patient outcomes, we consider that ECIRS could be a good option for the treatment of patients with staghorn stones and CRFE. In addition, Gökce et al. have recently pointed out that ECIRS demonstrates superiority to the antegrade flexible nephoscopy for the detection of residual fragments. Therefore, ECIRS renders a higher success rate.

Based on Gökce et al.'s data, we recommend performing ECIRS in all patients with CFRE because it could result in a better SFR. The laparoscopic or robotic approach for staghorn calculus in renal abnormalities could be another option when the percutaneous approach is not possible.

FIG. 3. Twenty-four hours postoperative nonenhanced CT, showing a stone-free status.

Conclusion

The ECIRS is a good alternative to consider in patients with CFRE who have a staghorn calculus with a reasonable success rate.

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Abbreviations Used

CFRE = crossed fused renal ectopia
CT = computed tomography
ECIRS = endoscopic combined intrarenal surgery
HU = Hounsfield units
PCNL = percutaneous nephrolithotomy

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