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CASE REPORT

Robot-assisted boari flap calycovesicostomy for failed uretero-pelvic junction obstruction: a novel approach to a complex problem

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Abstract
Uretero-pelvic junction obstruction (UPJO) is a common condition, often presenting in adulthood in developing countries. These cases can pose significant problems owing to late presentation and complications such as infection, stones, and impaired renal function. We present the case of a 28-year-old female who presented to us with recurrent symptoms and impaired drainage following a failed open pyeloplasty and robot-assisted ureterocalycostomy for right UPJO. She was managed by robot-assisted boari flap calycovesicostomy, an innovation which helped in salvaging her kidney; ensuring good drainage in the involved kidney. To our knowledge, this is the first such case in the literature in the management of complex UPJO.

Introduction

Uretero-pelvic junction obstruction (UPJO) is a common condition and most of patients in developing countries present in adulthood [1]. Management options vary, ranging from the standard dismembered pyeloplasty [2] to complex procedures like calycouereterostomy [3], pyelovesicostomy [4], boari flap calycovesicostomy [5], nephroplication and nephropexy [6], as well as nephrectomy in cases with irreversible impairment of renal function. Management of failed surgical repair is all the more challenging with a significant number being managed by open surgery, often requiring large abdominal incisions associated with longer hospital stay and higher morbidity [7]. The advent of robotic surgery has opened up new dimensions in easily performing complex reconstructive surgeries with minimal morbidity. We present the case of a young female who had persistent symptoms following a failed open pyeloplasty and robotic calycoureterostomy. She was successfully managed by robot-assisted boari flap calycovesicostomy, the first such case in the literature.

Case report

A 28-year-old lady who had undergone open pyeloplasty for right-sided UPJO and subsequently robot-assisted calycoureterostomy 2 years later for anastomotic stricture presented to the outpatient department of our hospital with right-sided flank pain and fever. She was found to have obstructed drainage with a differential function of 29% for the right kidney on renogram. The patient was managed conservatively with double J (DJ) stent placement and iv antibiotics and her symptoms subsided for 1 year. Despite conservative measures and placement of two DJ stents, her symptoms persisted for another year, and eventually, she developed an anastomotic stricture. Due to persistent symptoms, a percutaneous nephrostomy (PCN) was inserted on the right side which drained 1500 ml of urine per day. She was further evaluated with a CT urography which revealed a gross hydronephrosis in the right kidney with PCN in situ (Fig. 1a, b). A Tc^{99} diuretic renogram revealed obstructed drainage in the right kidney with pooling of tracer in the pelvi-calyceal system with a differential function of 34% in the right kidney. A nephrostogram also demonstrated pooling of contrast in the right kidney (Figs. 1c, 3a) with no drainage into the bladder (Fig. 1d). The renal functions of the patient were within normal limits. With an intent to preserve the kidney, she was planned for surgical intervention in the form of robot-assisted boari flap calycovesicostomy using Da Vinci SI system (Intuitive Surgical, Sunnyvale, CA, USA). The patient was placed in supine position and

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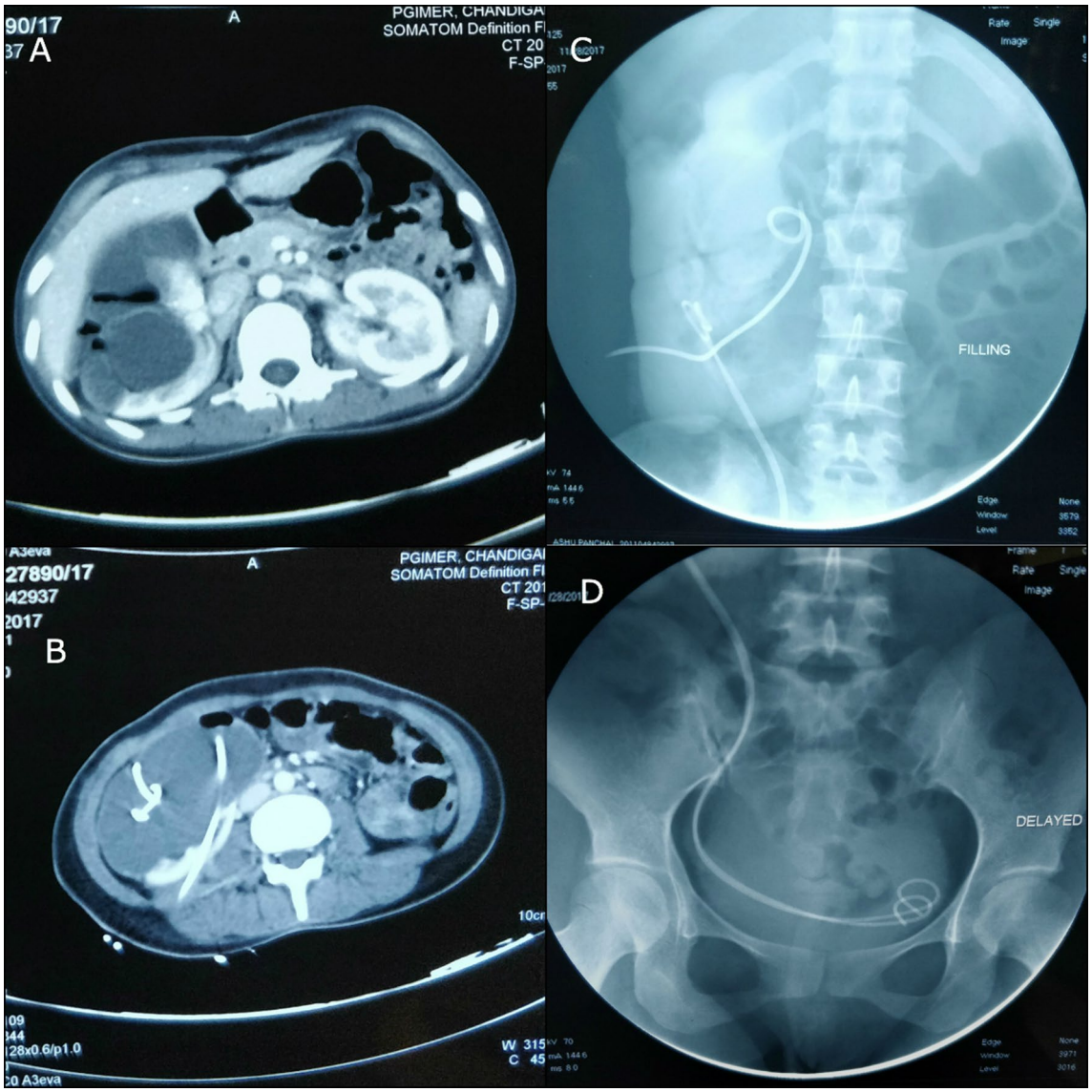

Fig. 1 **a** CT urography demonstrating an enlarged right kidney with dilated pelvi-calyceal system and preserved renal parenchyma. **b** Enlarged right kidney with PCN in situ and two DJ stents in the right kidney. Cortical thinning and enhancement of renal parenchyma visible. **c** Nephrostogram revealing dilated pelvi-calyceal system with pooling of contrast. **d** Nephrostogram demonstrating no drainage into the bladder despite the presence of two DJ stents

ports placed, as shown in Fig. 2a. The ascending colon was mobilized medially, and the lower pole of the hydronephrotic right kidney was dissected and hitched to the psoas tendon (Fig. 2b–d). The inferior calyx was dissected and a calycostomy created (Fig. 2e). Urinary bladder was filled with saline, and boari flap was raised from bladder dome and anterior wall (Fig. 2f–h). The Boari flap to the was mobilized to the calycostomy (Fig. 2i) and posterior layer of calycovesicostomy completed using vicryl 3–0 continuous suture (Fig. 2j). The suprapubic (18 Fr Foley) catheter (SPC) was passed through the calycovesicostomy, using it as a splint to tubularize the flap (Fig. 2k). A 6 Fr silicon DJ stent was also inserted through the anastomosis (Fig. 2l). The calycovesicostomy tubularized over the 18 Fr foley catheter was completed (Fig. 2m, p) and the bladder was closed using vicryl 2–0 in a continuous fashion (Fig. 2n–o). A 24 Fr drain was placed after ensuring a water-tight anastomosis. The operative time was 130 min. The drain was removed on postoperative day (POD) 3 and SPC clamped on POD 7. A repeat nephrostogram done on POD 14 revealed gravity-dependent drainage of contrast from calyx to urinary bladder without any delay through a wide lumen without leak (Fig. 3b, c). The patient is doing well 1-month post-surgery and voiding well.

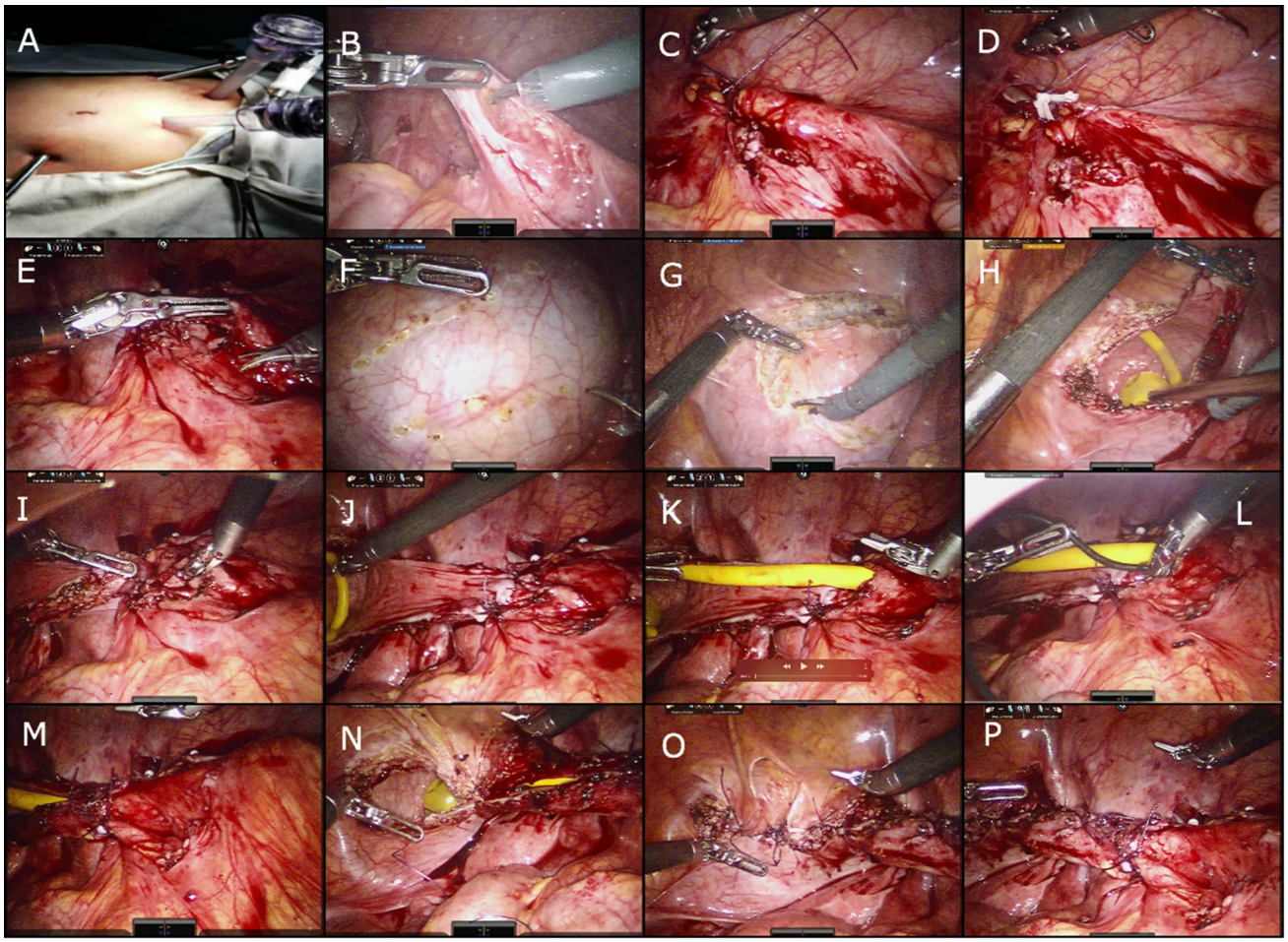

Fig. 2 **a** Port placement—12-mm camera port placed 5 cm above umbilicus in midline. Two robotic ports and one assistant port were inserted of 5-, 5-, and 12-mm size, respectively. **b** Dissection of lower pole and inferior calyx. **c, d** Lower pole calyx hitched to the psoas tendon. **e** Calycostomy. **f** Boari flap marked. **g, h** Boari flap created and lifted ensuring adequate vascularity. **i** Boari flap mobilized to the calycostomy. **j** Posterior layer of the calycovesicostomy. **k** 18 Fr foley catheter inserted as a splint. **l** 6 Fr silicon DJ stent inserted. **m** Anterior layer of calycovesicostomy. **n** Closure of vesicostomy. **o** Ensuring water-tight anastomosis. **p** Final boari flap calycovesicostomy

Discussion

UPJ obstruction is a common urological congenital anomaly with incidence of 1 in 1500 live births [2]. Usually, patient remains asymptomatic until the late stages, because the disease progresses slowly or may present with flank pain, fever, haematuria, or urinary tract infection including pyonephrosis. The hydronephrotic sac may be confused with hepatobiliary cyst, renal cystic tumor, retroperitoneal tumors, or loculated ascites [8]. Ultrasonography often reveals large cystic mass and axial imaging with CT scan or MRI reveals the diagnosis. A diuretic renogram helps in assessing the differential function of the kidney and planning treatment [9].

Our patient was first diagnosed as UPJO at the age of 22 years when she presented with pyonephrosis which was managed via PCN drainage. She subsequently underwent open pyeloplasty and robot-assisted calycoureterostomy. Since our patient had preserved renal function all through the course, salvaging the kidney was of utmost importance. A pyelovesicostomy was not possible due to multiple previous surgeries and a non-dependent pelvis. A direct calycovesicostomy was not feasible in this case; hence, boari flap calycovesicostomy was planned with robot assistance for this case. Metabolic complications associated with ileal transposition discouraged us from considering it as an option. The native ureter was not disturbed which reduced level of dissection needed and prevented further complications.

Surgical planning of failed anastomotic operation is more complex and challenging. Gravity-dependent pelviureteric drainage is the key in massive calyceal dilatation with impaired peristaltic activity in the collecting system [3, 5]. Boari flap calycovesicostomy provides a wide patent anastomosis with decreased risk of anastomotic stricture or

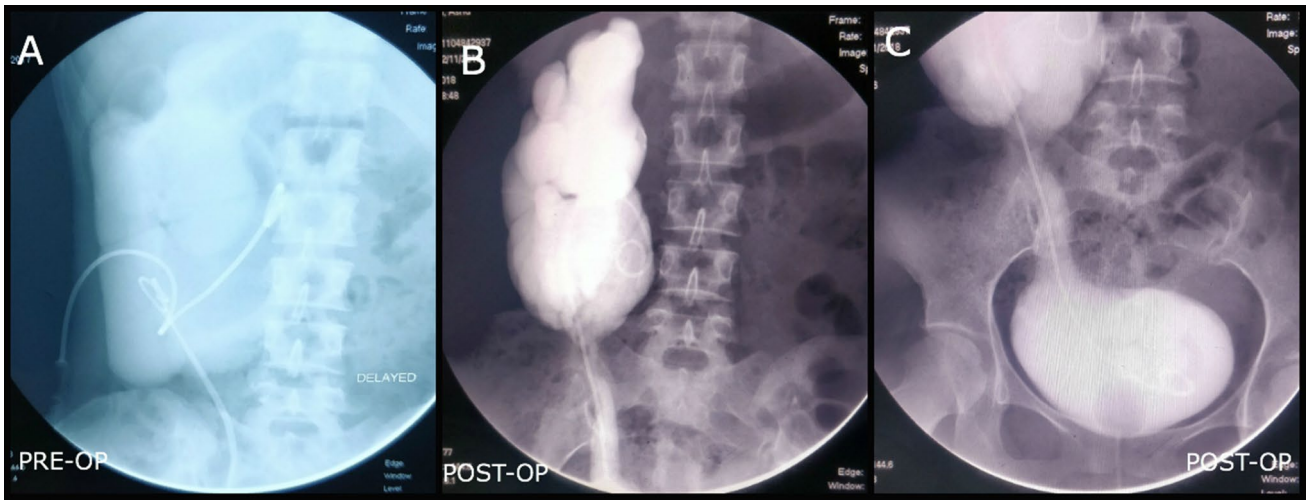

Fig. 3 **a** Delayed film of pre-operative nephrostogram showing pooling of contrast in the dilated pelvi-calyceal system even on delayed films despite the presence of two DJ stents. **b, c** Wide patent leak-free anastomosis with good gravity-dependent drainage after removal of SPC and per-urethral catheter

kinking as compared to pyelovesicostomy or calycovesicostomy [1, 3, 5].

Another concern in these patients is vesicourethral reflux (VUR) as the distended compliant calyceal system bears the brunt of reflux. The 18 Fr catheter used as a splint in our case provides a broad base and wide anastomosis, protecting the kidney from VUR. In addition, reflux may cause no harm clinically and histologically in these patients as long as a urine is kept sterile as has been shown in the previous studies [10]. However, these patients need close long-term follow-up and timely intervention if the renal function is threatened due to anastomotic strictures or bladder outlet obstruction [1].

Minimal access surgery with robot assistance provides the benefits of reduced morbidity and the ease of intracorporeal suturing. It also prevented large incisions, which would have been necessary previously for performing such complex and difficult operations. Performing these operations with conventional laparoscopic techniques is unsurmountable owing to difficulty in intracorporeal suturing in such cases. Author has wide experience in performing such complex procedures with robot assistance and it allowed for performing robot-assisted boari flap calycovesicostomy, which is probably first surgery in the published literature.

Conclusion

Robot-assisted boari flap calycovesicostomy is a safe and feasible procedure for patients with previous failed surgeries and provides a wide gravity-dependent drainage for the kidney with minimal morbidity and good outcomes.

Compliance with ethical standards

Informed consent Written informed consent was obtained from the patient for publication of this case report/any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal. Identity of patient is kept confidential. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from the patient and shall be available for review by the Editor-in-Chief of this journal.

Conflict of interest Santosh Kumar, Abhishek Chandna, Dharmendar Aggarwal, Shantanu Tyagi, and Nripesh Sadasukhi declare that they have no conflict of interest.

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