CASE REPORT

Boari flap reconstruction in a male infant with solitary kidney and associated megaureter

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SUMMARY

A 1-year-old male infant presented with fever and abdominal lump for 3 months with increased leucocyte count ($15\,300/\text{mm}^3$) and serum creatinine ($0.83\text{ mg\%}$). Abdominal ultrasound and renal scan demonstrated solitary left kidney with dilated tortuous left ureter. Voiding cystourethrogram was unequivocal. Left percutaneous nephrostomy was placed after poor response to perurethral catheterisation. His serum creatinine dropped to 0.58 mg/dL . Subsequent percutaneous nephrostogram and CT nephrostogram showed dilated left pelvicalyceal system, dilated, tortuous left ureter. A diagnosis of obstructed megaureter was made and ureteric plication and reimplantation planned. Intraoperatively, there were primitive ureteral valves until proximal one-third of the ureter. The distance between the upper ureter and bladder was $\sim 6\text{ cm}$. This defect was bridged by Boari flap. The postoperative period was uneventful and now after 6 months of follow-up, he is doing fine.

BACKGROUND

We report our experience of Boari flap reconstruction in an infant aged 1 year with megaureter and solitary kidney with renal failure. Few reports of Boari flap reconstruction in infants do exist in the literature for extensive ureteral loss due to various reasons,^{1 2} which are different from our case report.

CASE PRESENTATION

We describe a case of a male infant aged 1 year who presented with intermittent fever since 5 months and abdominal lump for last 3 months. On clinical examination, the patient had large vague lump on the left side of the abdomen measuring $\sim 10 \times 8\text{ cm}$.

INVESTIGATIONS

Blood investigations at the time of admission were as follows: haemoglobin $7.5\text{ g\%}$, increased leucocyte counts ($15\,300/\text{mm}^3$), blood urea 61 mg/dL , serum creatinine 0.83 mg/dL , normal serum electrolytes and normal liver function tests. Urinalysis showed plenty of pus cells; urine culture showed growth of *Escherichia coli*.

The patient was treated with parenteral antibiotics. Abdominal ultrasound (figure 1) demonstrated solitary left kidney with gross dilation of the left pelvicalyceal system. Voiding cystourethrogram (figure 2) was unequivocal, and there was no evidence of vesicoureteric reflux.

TREATMENT

We placed an 8 Fr Foley perurethral catheter; instead of improving, the patient deteriorated further. Because of persistent left hydroureteronephrosis, rising serum creatinine and increased leucocyte counts, we placed left percutaneous nephrostomy under general anaesthesia. Left nephrostomy drained $\sim 2000\text{ mL}$ of turbid urine immediately, followed by 800 mL of urine/day. Initially, the patient had postobstructive diuresis which resolved gradually. The patient showed marked clinical and biochemical improvement. He became afebrile and his serum creatinine dropped to 0.58 mg/dL .

Subsequent nephrostogram showed dilated left pelvicalyceal system with dilated and tortuous left ureter. Findings of percutaneous nephrostogram were corroborated with CT nephroureterogram (figure 3). The absence of the right kidney was confirmed on renal scan which reported effective renal plasma flow of the solitary left kidney as 172.4 mL/min .

A diagnosis of obstructed megaureter was made and the patient was prepared for ureteric plication and reimplantation. Cystoscopic examination revealed normal left ureteric orifice with non-visualisation of the right ureteric orifice.

A lower midline incision was made. Cystotomy was performed and the ureter was mobilised from within the bladder until the ureterovesical junction where it was divided. A stay suture was taken from the distal end of the ureter. We attempted to pass a guide wire into the pelvicalyceal system through the distal end of the ureter, but the guide wire could not be negotiated due to tortuosity; hence, ureterotomy was performed. On inspection, primitive ureteral valves were present in the ureter which were apparently obstructing the guide wire. The

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Figure 1 Ultrasound abdomen: left kidney with percutaneous nephrostomy in situ.

Figure 2 Voiding cystourethrogram: smooth bladder outline with no evidence of vesicoureteral reflux.

ureter was further explored proximally until we encountered normal ureter in the proximal one-third of the upper ureter. Because of the small habitus of the patient, the distance between the upper ureter and bladder was ~6 cm.

Decision was taken to create Boari flap to bridge this gap. Boari flap was extended until the distal end of the proximal ureter without tension (figure 4). JJ stent was placed and end-to-end anastomosis was performed in an interrupted manner. The bladder dome was fixed to the psoas tendon. The patency of the anastomosis was checked by filling the bladder with saline; no leakage was observed. A supravescical drain was placed at the end of the procedure.

There was no leakage of urine in the postoperative period and drain was removed on the fourth postoperative day. The patient was discharged after percutaneous nephrostomy removal on the 10th postoperative day with perurethral catheter in situ.

Figure 3 (A) Left nephrostogram (30 min film): severely dilated and tortuous ureter with non-drainage of contrast in the bladder. (B) Preoperative CT nephroureterogram: severe hydronephrosis with non-drainage of contrast in the bladder.

Figure 4 Boari flap with JJ stent.

The catheter was removed on the first follow-up visit, 1 week after discharge. JJ stent was removed after 6 weeks.

OUTCOME AND FOLLOW-UP

This patient is in the sixth month of follow-up and is doing well. Follow-up ultrasound scan and CECT KUB show mild hydronephrosis. Follow-up renal scan (figure 5) shows normal drainage. His latest serum creatinine is 0.7 mg/dL.

DISCUSSION

Most of the literature on Boari flap reconstruction is focused on the adult age group. It is not clear whether adult techniques can be used in the paediatric population. The options available for large ureteric defect in adults are transureteroureterostomy,³ ileal segment replacement of the lost ureter, psoas hitch with Boari flap and renal autotransplantation.⁴

Ileal segment replacement of the ureter is a well-described technique. It has good results if performed with proper techniques, but it is an extensive surgical procedure with long-term morbidity and complications.⁵

Renal autotransplantation⁶ is also described in the literature, but we felt that it was not a good option in our patient as this procedure requires ureteroneocystostomy; moreover, effective renal plasma flow of the solitary kidney was suboptimal.

Figure 5 Follow-up renal scan: normal drainage from the left kidney to the bladder.

We managed the patient with Boari flap and psoas hitch because transureteroureterostomy was not an option for our patient as it requires opposite functioning kidney and a long viable segment of the ureter to cross the midline. Requirements for successful Boari flap are sufficient bladder capacity, broad-based Boari flap and adequate mobilisation of the bladder. It has excellent results in ureteric substitution.⁷ Tension-free anastomosis is must for successful repair. It also provides physiological urinary conduit which minimises complications.

Few reports exist in the literature regarding Boari flap repair in children. Most of these manuscripts are for post-transplant ureteric obstruction,⁸ postendopyelotomy ureteric stricture⁹ and iatrogenic injuries.¹⁰

After extensive search of the literature, we came across two manuscripts which reported Boari flap in infants. Routh *et al*² report iatrogenic ureteral injuries in the paediatric age group (range 7 days to 14 years). They reported 10 ureteral injuries repaired by a single surgeon with Boari flap; at a median follow-up of 1 year, all patients were doing fine. They suggested

that standard techniques used in adults can be used in children with good long-term success rate.

Redman *et al*¹ describe a case of a male aged 1 month who sustained extensive midureteral loss due to candidal infection. They managed this case with renal mobilisation and Boari flap. The patient had good outcome at 1-year follow-up.

These two reports are from North America. To the best of our knowledge, ours is the first case report from India and probably first such report from Asia.

Learning points

- Requirements for successful Boari flap reconstruction are sufficient bladder capacity, broad based Boari flap and tension free anastomosis.
- Boari flap reconstruction is a viable option in infants with megaureter and solitary kidney having large ureteric defect.

Contributors RJS and VS did the surgery. DKS contributed in conception and design of the study and he worked on drafting the article or revising it critically for important intellectual content. AKS helped in acquisition of data.

Competing interests None declared.

Patient consent Obtained.

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