

## Laparoscopic Heminephrectomy for Duplex System-A Single Center Experience

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**Abstract:** The standard treatment for a duplex kidney with poorly functioning upper pole moiety is ipsilateral upper pole heminephrectomy. This procedure is usually performed by open surgery, but with recent developments in techniques of laparoscopy, it can be done with it, safely. In this study we report our experience with laparoscopic hemi nephrectomy (LH) in children with duplex kidneys, with respect to duration of surgery, hospital stay and complications. A retrospective analysis of 7 children with duplex kidney with an upper pole nonfunctioning moiety who underwent LH was done. All seven patients had upper pole hemi nephrectomy, the average duration of surgery was 80-85 minutes, average duration of stay was 3.5 days in uncomplicated cases with complications in two children. Laparoscopic hemi nephrectomy is a safe approach to duplex system in children.

**Keywords:** Laparoscopy, Hemi nephrectomy, duplex kidney, children

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### I. Introduction

Congenital anomalies of the kidney and urinary tract exhibit a wide anatomic spectrum. Congenital abnormalities of urinary system (CAKUT) is a common occurrence with incidence of 20-30% of all anomalies detected prenatally of which Duplex occurs 1 in 125 cases or 0.8% of a non-selected population [1]. These anomalies include renal anomalies and ureteropelvic anomalies, duplex collecting systems, and anomalies of the bladder and urethra. The ureteral anomalies can be of termination, structure, number or position.

Duplex renal systems are commoner in females (65% of cases) and occur bilaterally in 20% of cases. Incomplete duplication is three times more common than complete duplication, which is reported to occur in about one of every 500 people. Duplications may be complete or incomplete. Common presentations of duplex system are the child may be asymptomatic or symptomatic like UTI's with vesicouretric reflux or ureteroceles or ureteropelvic obstruction. Prenatal diagnosis fetal duplex renal system is rare.

Duplex renal system is a general definition congenital abnormality of the urinary tract characterized by partial or total duplication of the collecting system and renal pelvis and parenchyma [2]. It can be classified on the basis of which renal pole is involved (i.e., superior or inferior); on whether or not an ureterocele is associated with; and on the position of ureterocele (i.e., within the bladder or in the urethra) and function of the distal ureteral orifice (blind, stenotic, sphincteric or incompetent [3].

On prenatal sonography various findings can be detected. Always affected kidney has a greater size than the other. If urinary flow is affected, obstruction findings can be seen: eccentric hydronephrosis, most commonly involving the upper pole of the kidney; ballooning of the submucosal segment of the ureter into the bladder, leading to an intravesical cyst (ureterocele); and dilated ureter, due to either stenosis at the ureterovesical junction or reflux [4]. Structural anomalies of the kidney such as duplex kidneys are associated with a malpositioned ureteral orifice in embryonic period [5]. So, the underlying cause of duplex kidney and ureters may be the abnormal positioning and development of the primary ureteric bud, or the development of an ectopic bud along the anterior-posterior axis of the Wolffian ducts. Consequently, two pelvicalyceal systems, associated with incomplete, partial or complete duplication of the ureters (single, bifid or double ureters).

A bifid pelvis occurs when two pelvicalyceal systems join at the ureteropelvic junction. Partial duplication occurs when two bifid ureters join prior to emptying into the bladder. Where there are double ureters, each ureter drains a separate pelvicalyceal system and opens separately into the urinary or genital tract. Duplex kidneys have upper and lower poles, with the upper pole comprising about one-third of the parenchyma [6]. The upper pole ureter crosses the lower pole ureter, and may end low downside to other in the bladder, or ectopically, usually into the urethra, or rarely to vagina in females. Where it ends in the bladder it often forms an intra vesical ureterocele. Ureterocele forms cystic dilatations of the submucosal segment of the intravesical ureter with narrowing of the ureteral orifice [7]. The Weigert-Meyer Law is used to describe the migration and



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## II. Materials and methods

Children with a symptomatic (flank pain, UTI ) double moiety were evaluated in the Department of Paediatric Surgery, Coimbatore Medical College Hospital from January 2016 to January 2018. A total of seven children were included in the study. Children were subjected to routine blood investigations including urea and creatinine. Children were further subjected to imaging and nuclear studies for anatomical evaluation and to assess the function.. All children had right side double moiety and were subjected to transperitoneal laparoscopic heminephrectomy.

## III. Surgical technique

Under general anesthesia, a foley catheter and a nasogastric tube was inserted. Children were placed in a 60 degrees lateral decubitus position. The abdominal cavity was explored using 4 port transperitoneal approach. After incising the white line of Toldt, medial mobilization of colon and duodenum, the renal pedicle was exposed. After complete dissection of both renal artery and vein, Gerota's fascia was incised and the kidney fully mobilized within the Gerota's fascia. Afterwards, the dilated ureter of the corresponding nonfunctioning moiety was localized and carefully dissected to the renal hilum.

Care was taken not to induce ureteral devascularization of the other healthy ureter. The diseased ureter was clipped and divided at the level of lower pole and used as a handle and guide to facilitate the dissection of segmental branches of renal artery and vein which supplied the nonfunctioning moiety. Then, the corresponding segmental renal artery and vein were doubly clipped and divided; the nonfunctioning renal moiety was incised and separated from the whole renal unit on the demarcated ischemic line, using a ureteric stamp as a handle which facilitated this part of the procedure.

No collecting system reconstruction was made. The specimen was extracted from the abdominal cavity through a 10 mm port. The retro peritoneum was irrigated and suctioned, hemostasis of the renal cut surface was ensured and an external drainage was placed with a tubular drain. All children received postoperative antibiotics and analgesics according to our hospital protocol.

Data regarding operative time, duration of stay, post operative pain and complications were recorded and analysed.

## IV. Results

In our study seven children were included of which five were males and two females. The average operative time was **60 +/- 30 days**. All patients were discharged from the 3rd to 8 th day with a mean hospital stay of **4 days**. Neither major complication nor conversion was recorded during the procedure. Postoperatively two children developed minor urinary leak that was managed conservatively. On mean follow-up of minimum **6 months** no disturbing symptoms or episodes of urinary tract infections (UTIs) were detected

AGE	SEX	ETIOPATHOGENESIS	OPERATIVE TIME	HOSPITAL STAY	COMPLICATIONS
6MONTHS	F	Recurrent UTI	80	7	Minor Urinary leak
2YRS	M	Pyonephrosis(VUR)	70	4	Nil
5YRS	M	Recurrent UTI	75	3	Nil
3YRS	F	Pyonephrosis(VUR)	90	3	Nil
2YRS	M	Recurrent UTI	80	8	Minor Urinary leak
1 YRS	M	Recurrent UTI	80	3	Nil
3YRS	M	Recurrent UTI	80	3	Nil

## V. Discussion

Duplication of the ureter is the most common anomaly of the upper urinary tract which often goes unrecognized until adulthood. The common complication of double moiety is obstruction, poor functioning, urinary tract infection or flank pain. Ipsilateral heminephrectomy is the treatment of choice for nonfunctioning symptomatic patients which can be done by open or laparoscopic method each having its own merits and

demerits. Due to advances and constant learning laparoscopic approach has become the standard procedure. It can be done retroperitoneal or transperitoneally.

The first case of a laparoscopic partial nephrectomy was reported by Winfield et al. in 1992. In 1993, Jordan and Winslow published the first laparoscopic upper pole heminephrectomy case. Since then several reports on laparoscopic heminephrectomy have been published describing advantages, disadvantages and complications of the procedure.

Literature review shows that the main complications of laparoscopic heminephrectomy are urinoma, urine leakage, recurrent urinary tract infections, postoperative hypertension, and functional loss of the remaining moiety. In our series there was no functional loss of the remaining moiety.

Many published series proved the efficacy of the procedure in pediatric patients. Series which have exclusively studied the efficacy of the procedure in adult cases have recently been published by Abouassaly et al. [11,12] and Gao et al. Castellan et al. published their experience in a series of 48 paediatric patients (mean age 4.08 years) who underwent transperitoneal and retroperitoneal laparoscopic heminephrectomy [13]. Mean operative time was 125 and 133 minutes for transperitoneal and retroperitoneal, respectively. Mean hospital stay was 2.6 days in the transperitoneal and 2.3 days in the retroperitoneal group. One retroperitoneal procedure required conversion to open surgery. In this largest series of laparoscopic heminephrectomy, complications were seen in 5 patients (10%), including urinary leak, urinoma, pneumothorax, recurrent urinary tract infection, and postoperative hypertension. The authors found that laparoscopic heminephrectomy can be performed with minimal morbidity, improved cosmesis and short hospital stay.

Laparoscopic approach to heminephrectomy offers the patient the typical benefits of laparoscopy including shorter hospital stay, minimal morbidity, improved cosmesis, and lower need for analgesic use [14], [15]. Improved preservation of the functioning pole of kidney could be an advantage of laparoscopy specifically mentioned in this procedure. It is of worth noting that the objective of heminephrectomy is the safe maximal removal of the nonfunctioning moiety and simultaneous maximal preservation of the functioning pole. Laparoscopic approach enables an excellent differentiation of each hemi renal tissue, separating the ill kidney and preserving the maximal possible function for the other half-kidney [15].

Laparoscopic approach to heminephrectomy has many benefits like shorter hospital stay, minimal morbidity, improved cosmesis, and lower need for analgesic use.

## VI. Conclusion

Laparoscopic procedures have become an integral part in the management of many urologic disorders. Laparoscopic heminephrectomy has a valuable role in the treatment of duplex kidneys. It can be performed with minimal morbidity once mastered. Excellent visualization during laparoscopy helps better preservation of renal pedicle especially in pediatric age groups making it the preferred approach for management of atrophic renal moieties in duplex systems.

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