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Case Study

Embryological, radiological and surgical perspects of Duplicated ureter with bilateral aberrant renal arteries - A case report

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Abstract: *Duplicated ureter is relatively common congenital anomaly of urinary system and the knowledge of these congenital anomalies along with variations of renal vasculature is must for interventional radiologist, urologist and laproscopic surgeons for urological procedures and intrarenal or pelvic surgeries. In this reported case, the presence of duplicated ureter on left side was seen in 50 years old female with bilateral aberrant renal arteries, both arising from ventral aspect of abdominal aorta 2-3 cms above the bifurcation of aorta. Patients are usually asymptomatic need not to be intervened but if symptoms of urinary tract infections or renal functions impairments appear urgent interventions are must.*

Keywords: *Human kidney, Duplicated ureter, aberrant renal artery, Extra Renal Artery (ERA)*

Introduction

In this modern era of super specialization, there is increase in interventional radiological procedures, urological and vascular operations, laproscopic procedures and even renal transplantation. Knowledge of urinary system anomalies and vascular variations is of prime concern for clinicians. Duplication of the ureter has a birth frequency of about 1 per cent and the proportion affected of sibs and parents of probands is about 12 per cent [1].

Ureteral duplication may be genetically determined by an autosomal dominant trait with incomplete penetrance [2]. Duplication of ureter is relatively common anomaly and if it is associated with aberrant/accessory renal arteries it forms one of the common differential diagnoses for ureteric calculi and recurrent urinary tract infections. So such anatomical variations must be considered during radiological, urological and laproscopic surgical procedures.

Case Report

During routine dissection on female cadaver of around 50 years of age in Dissection hall of Department of Anatomy, AIIMS, Rishikesh following observations were made-In this case, on left side, duplicated ureters have different origin. Upper ureter (UU) originated directly from above the hilum from upper pole of left kidney by passing between two large tributaries of left renal vein (LRV). While Lower ureter (LU) originated from hilum in posterior relation to renal vessals. Both ureter have seperate abdominal course but in pelvis both were wrapped in a common fascial sheath below pelvic brim and ultimately united 1cm before entering into urinary bladder(found on exploration of fascial sheath).(Fig-1,2)

Fig.1

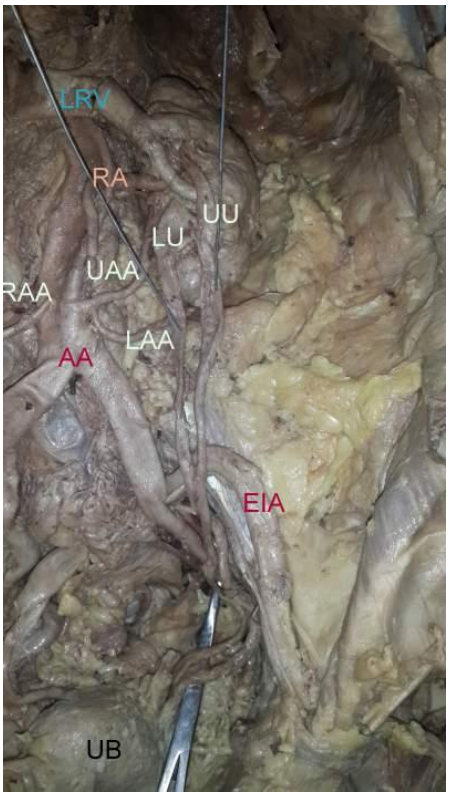

Fig. 2:

In addition to duplication of left ureter, this cadaver was also having bilateral aberrant renal arteries. **On left side**, there was an aberrant artery (AA) directly arising from ventral aspect of abdominal aorta about 2-3 cms above the bifurcation of abdominal aorta. Then this aberrant renal artery showed early division into two branches close to its origin. Upper branch (UAA) was entering hilum by further dividing into two branches and lower polar branch (LAA) was entering directly in the capsule at lower pole of left kidney. These aberrant arteries were posterior to duplicated ureters on the left side.(fig-1,2) **On right side**, there was an lower polar aberrant renal artery at same level as left and arising from ventral aspect of abdominal aorta and entering directly by piercing capsule of lower pole of right kidney. (Fig-1, 2)

Discussion

Duplicated ureter

Duplicated ureter has an incidence of 0.5%. The incidence may ranges from 0.5% to 3.0% [3] and It is two to five times more common in females [4] and more common on right side [5]. The kidney is formed when the ureteric bud, arising from the mesonephric duct, meets the metanephros, and by a process of reciprocal induction brings about the formation of the kidney. The distal part of the ureteric bud eventually incorporates into the bladder to from the trigone. At the cranial end branching of the ureteric bud gives rise to the ureter, renal pelvis, calyces and collecting ducts. Premature branching of the ureteric bud results in an incomplete duplex with ureters that meet before the bladder, or a bifid renal pelvis. If more than one bud develops and migrates to the metanephros a duplex kidney with two separate ureters forms Duplicated ureters [6]. Ureteric duplication shows many variations but as a rule, the duplicated ureters unite a little above the bladder and open with only one vesical orifice**.** In this case duplicated ureters were found on left side in adult female cadavaer, which were united within common fascial sheath 1 cm before entering into urinary bladder. Summers JE also

found duplication of ureters more commonly on the left side [7]. Incomplete ureteral duplication, in which one common ureter enters the bladder, is rarely clinically significant [8]. Duplicated ureter may remain asymptomatic and create academic interest only lest it may cause complications like ureteric stenosis, urinary lithiasis and pyelonephritis with clinical presentations like fever, chills, nocturia, dysuria or gross hematuria [9].

A duplicated urinary system is also prone to urinary tract infection either from obstruction of ectopic ureter, calculi or vesicoureteric reflux, ureteropelvic obstruction [9]. This type of anomaly is also associated with other congenital anomalies[9] such as Goltz's Syndrome , high cephalad kidney and duplication of renal pelvis, ureterocele, malrotation, bladder diverticulum , unilateral pulmonary hypoplasia and complete duplication of contralateral ureter .

So consideration of anatomical variations of the renal collecting system is of great importance for surgical and radiological approaches and other evaluative methods like cystoscopy and retrograde pyelography.

Aberrant Renal arteries

Variations in renal arteries are highly common and such variations may differ in number, mode of origin, branching, course and termination [10].Apart from renal artery, Extra renal arteries (ERA) are broadly divided into two types- aberrant and accessory arteries.[11]The aberrant (Polar) arteries are those which supply the kidney (poles) without passing through hilum, whereas the accessory(Hilar) ones are those which supply the kidney by passing through hilum.

The frequency of extra renal arteries (ERA) is generally between 28%–30% in anatomic and cadaver studies [12]. The presence of an accessory/aberrant renal artery at the lower pole is in fact a segmental vessel that is a persisted foetal vessel with an abnormal origin [13].

In this case bilateral aberrant artery was found. On the left side, Upper branch for hilum and lower polar branch for lower pole of left kidney, while on right side unbranched lower polar aberrant artery for lower pole of right kidney. On renal angiogram, the incidence of extra renal artery is more on left side (27.6%) than on the right side (18.6%) and bilaterally in 10.2% and they also observed the sex ratio to be 28% in males 16.4% in females [14].

Thus the Renal vessals variations are of interest to medical and surgical personnel because of wide spectrum of disease associated with kidney like Hydronephrosis, hypertension due to fibromuscular dysplasia, retroperitoneal tumours etc and due to the gradual increase in interventional radiological procedures, urological and vascular operations, laproscopic procedures and renal transplantation [15] A failure in recognizing these anomalies may lead to a severe haemorrhage and it may result in complications and even renal graft loss.

References

1. Carter CO; The genetics of urinary tract malformations: J Genetic Hum. 1984 Mar;32(1):23-9
2. Muhammad A Salam; Genetics of ureteric duplication: Principle and practice of urology ,Section-4 ,Page-834
3. Adel K. Afifi, Ryosuke Miyauchi, Ronald A. Bergman; Illustrated Encyclopedia of Human Anatomic Variation: Opus IV: Organ Systems: Urinary System Kidneys, Ureters, Bladder, and Urethra; www.anatomyatlases.org . Accessed on Nov 2010
4. George S Bisset III, Janet L Strife .The Duplex collecting system in girls with urinary tract infection ; Prevalence and Significance. AJR. March 1987; 148: 497-500
5. Ray Dyer, Stephen Miller, Bonnie L Anderson, James E Drake, John S Shaffer. The Segmental Nephrogram. AJR. August 1985; 145: 321- 322
6. Meyer R. Normal and abnormal development of the ureter in the human embryo; a mechanistic consideration. Anat Rec 1946; 96(4):355-371
7. Summers JE. Double ureter. Report of a nephrectomy done upon a young child with this condition present. Ann Surg. 1901; 33: 39–41

8. Gatti JM. Ureteral Duplication, Ureteral Ectopia, and Ureterocele. http://emedicine.medscape.com/article/1017202-overview (accessed March 2011)
9. Das S, Dhar P, Mehra R.D. Unilateral Isolated Bifid Ureter: A Case Report. J Anat. Soc. India. 2001; 50(1): 43-44
10. Loukas M, Aparicio S, Beck A, Calderon R, Kennedy M. Rare Case of Right Accessory Renal Artery Originating as a Common Trunk with the Inferior Mesenteric Artery: A Case Report. Clin Anat 2005; 18:530- 535
11. Rao TR. Rachana. Aberrant renal arteries and its clinical significance: a case report. Int J Anat Var 2011; 4: 37-39
12. Khamanarong K, Prachaney P, Utraravichien A, Tong-Un T, Sripaoraya K. Anatomy
13. of renal arterial supply. Clin Anat 2004; 17:334-336
14. R.M.H Mcminn, Last's Anatomy Regional and Applied, 8th Edition, Ch – 5, 370-372
15. Satyapal KS, Haffejee AA, Singh B, Ramsaroop L, Robbs JV, Kalideen JM. "Additional renal arteries: incidence and morphometry," Sur. Radiol. Anat. 2001; 23 (1): 33-38
16. Weinstein BB, Coun-riss EH, Derges VJ. The renal vessels in 203 cadavers. Urol. Cutan. Rev., 1940; 44: 137-139