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A Retrospective Study of Renal Dysplasia in Children with Posterior Urethral Valves: A Tertiary Centre Experience

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Abstract :
Aims: *To study the renal histology of nephrectomy specimens in children with renal dysplasia associated with posterior urethral valves and ipsilateral vesicoureteral reflux or obstructed megaureter.*
Materials and methods: *Single institutional retrospective study of children with posterior urethral valves who underwent nephrectomy for diminished renal function between July 2014 to June 2017. Histological examination of each nephrectomy specimen was done.*
Results: *15 children with a mean age of 44 months (range 3 - 60 months) underwent unilateral nephrectomy (left side 10, right side 5) following valve ablation. Histological examination showed secondary pathological malformations in all with 80% showing dysplastic changes*
Conclusions : *Renal dysplasia with posterior urethral valves is not uncommon. However, subvesical obstruction may not be the only cause of renal malformation.*
Keywords: *Posterior urethral valve, renal dysplasia, primary, secondary*

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I. Introduction

Renal dysplasia(RD) is associated with posterior urethral valves (PUV) in ~20% cases. (1) Whether the dysplastic changes in the kidney is a primary malformation or a result of subvesical obstruction remains unresolved. This has tremendous influence on the treatment modality and optimal timing of therapy aimed towards preservation of the long term renal function.

The Histological findings of mesenchymal tissue, foetal cartilage, primitive glomeruli and tubules in the background of well developed renal parenchyma are considered to be characteristic of primary renal dysplasia. Renal cortical atrophy, interstitial fibrosis and nephritis are the hallmark mark of recurrent pyelonephritis.

II. Materials and methods

Single centre retrospective review was carried out between July 2014 - June 2017. Records of all patients with PUV with dynamic renal scan showing split function <10% presenting with recurrent urinary tract infection subsequently undergoing nephrectomy were analysed.

Variables noted for analysis were: age at diagnosis, valve fulguration & nephroureterectomy, laterality and the histological examination findings.

Preoperative evaluation included : blood pressure measurement, renal ultrasound , renal isotope scan (DTPA/ DMSA) , serum creatinine estimation and urine culture & sensitivity. Nephroureterectomy was done by standard retroperitoneal flank approach and the specimens sent for histological examination.

III. Results

15 boys with a mean age 44 months (range 6-60 months) underwent nephroureterectomy (left side 10, right side 5) between July 2014 - June 2017 which was sent for histological examination.

The age distribution of time of diagnosis and subsequent treatment varied considerably with 4 patients diagnosed in utero, 5 in the 1st month of life and the remainder between 13 and 60 months of age.

All the 15 boys presented with type 1 valve. 13 boys (86.7%) had associated ipsilateral VUR. 2 boys (13.3%) had obstructive megaureter.

On exploration all the affected moieties were found to be smaller in size with irregular surfaces with or without dilated ureters. Abdominal drain was placed in one case with perinephric abscess.

Postoperative recovery was uneventful in all the patients.

On histological examination, presence of mesenchymal tissue, fetal cartilage, primitive glomeruli and ill formed tubules with well formed renal parenchyma were characteristic of primary renal dysplasia while

presence of renal cortical atrophy, interstitial fibrosis and interstitial nephritis were the hallmark of secondary renal dysplasia.

12 specimens (80%) showed features of primary renal dysplasia while all (100%) showed secondary pathological changes, consistent with recurrent pyelonephritis.

IV. Discussion

From the available literature on the embryological development of urological tract, histology and fetal ultrasound findings of urological tract, the following points can be highlighted:

1) Organogenesis of urogenital tract in human embryo begins at 4th week and is completed by 12th week of gestation. (2)
2) Embryologically there are 2 protagonists responsible for the normal development of kidney, namely nephrogenic material(pro/ meso/ meta nephros) and ureteral bud(wolffian bud). A ureteral bud which joins the bladder at normal position induces a normal renal structure, whereas a laterally placed bud induces a dysplastic or hypoplastic kidney(the bud theory) (3,4)
3) Song and Yosypiv in their review focused on the genetic mechanism leading to congenital anomalies of the kidney and urinary tract (CAKUT). (5)
4) The occurrence of dysplastic changes in the kidney are a combination of primary disturbed organogenesis and early (before 10 weeks of gestation)intra renal reflux (IRR) associated with PUV. (6)
5) Examination of fetal kidney is possible at 15 weeks , reliable documentation from 20 weeks and early assessment of dilation of the renal pelvis at 22 weeks. (6)
6) Intrauterine drainage of the upper tract even when performed at 14 weeks (by experienced radiologists) can't ensure undisturbed organogenesis. (7)

Approximately 20% patients with PUV have associated VUR & renal dysplasia(VURD), 15% persist with reflux without RD, whereas VUR resolves in another 15%. (6) Inspite of great advances in the management of PUV, 25-40% patients progress to end stage renal disease(ESRD). (8)

Hoover and Duckett were the first to coin the term VURD. It's incidence is ~20% and is seen more commonly in the left side(70%). (1)

In our study ~80% patients had VURD on the left side.

All the patients showed features of secondary renal dysplasia while 12 patients (80%) had histological evidence of primary renal dysplasia.

V. Conclusion

Renal dysplasia associated with posterior urethral valves is not uncommon. However subvesical obstruction is not the only cause. There is scope for further investigations focussing on (1) genetic mechanism of CAKUT and (2) reliable methods for prenatal assessment of differential renal function in a large sample of patients in a well designed multicentric prospective study before drawing a definite conclusion on the age old debate of whether renal dysplastic changes in children with PUV are a primary or secondary malformation.

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