The Pattern of Ocular Abnormalities in Childhood Chronic Renal Failure

Aamir Jalal Al Mosawi*

Department of Pediatrics, P.O. Box 70025, Al Kadhimiyia, Baghdad, Iraq

Abstract: *Background*: Few literatures reported the pattern of ocular abnormalities in chronic renal failure (CRF). The aim of this paper is to determine the pattern of ocular abnormalities in childhood CRF.

Patients and Methods: From January 1993 to July 2007, 80 patients with a diagnosis of chronic renal failure (CRF) were observed at the University Hospital in Al Kadhimiyia. They were examined to determine the presence of ocular abnormalities. Fifty one patients were males (63.75%) and 29 (36.25%) were females. The male-female ratio was 1.75, and the age at referral ranged from 2 months to 18 years (mean 9 years).

Results: Corneal cystine crystals were the most common ocular abnormalities associated with childhood CRF observed in 6 patients with Nephropathic cystinosis (7.5%). Congenital cataract and glaucoma were the second most common ocular abnormality; observed in 3 patients (3.75%) with Oculo-cerebro-renal syndrome (OCRS).

Conclusions: Ocular abnormalities are relatively common in childhood CRF occurring in approximately 19%.

Keywords: Eye abnormalities, children, renal failure.

INTRODUCTION

Few literatures reported the incidence of ocular abnormalities in chronic renal failure (CRF) [1]. The aim of this paper is to determine the incidence of ocular abnormalities in childhood CRF.

PATIENTS AND METHODS

From January 1993 to July 2007, 80 patients with a diagnosis of chronic renal failure (CRF) were observed at the University Hospital in Al Kadhimiyia. The diagnosis of CRF was based on a rise in serum creatinine above 2 mg/dl for at least 3 months, in association with supportive clinical and biochemical abnormalities. The patients were examined retrospectively before the year 1999 and prospectively thereafter to determine the presence of ocular abnormalities.

RESULTS

Fifty one patients were males (63.75%) and 29 (36.25%) were females. The male-female ratio was 1.75, and the age at referral ranged from 2 months to 18 years (mean 9 years). The single most common cause of CRF was chronic glomerulonephritis (GN). Hereditary disorders and genetic syndromes accounted for 28.75%, with nephropathic cystinosis as the most common hereditary disorder causing CRF. There were 23 patients (13 boys, 9 girls) with CRF resulting from hereditary disorders and genetic syndromes. Congenital and obstructive uropathy were responsible for CRF in 14 patients (17.5%, 11 boys, 3 girls). Oculocerebro-renal syndrome and a severe variant of Hinman syndrome (rare causes accounted for 10% of the CRF in the patients in this series. Table **1** shows the etiology of CRF in this series.

Corneal cystine crystals were the most common ocular abnormalities associated with childhood CRF observed in 6 patients with nephropathic cystinosis (7.5%). Congenital cataract & glaucoma were observed in 3 patients (3.75%) with Oculo-cerebro-renal syndrome (OCRS). Congenital cataract and chorioretinal hypoplasia were present in 1 patient with OCRS. Hypertensive retinopathy occurred in 2 patients. Acquired bilateral cataracts occurred in one patient with Allen-Hinman syndrome in association with hypocalcaemia and non-compliance with calcium and one-alphacalciferol supplementation. Retinitis pigmentosa in one patient with Laurence Moon Biedle syndrome. Bilateral optic atrophy in one patient with familial nephropathy associated with club feet. Proptosis in one patient with membranoproliferative glomerulonephritis.

Only one of the 6 patients with nephropathic cystinosis received oral cysteamine brought to him from outside the country. Cysteamine eye drops were not available to any patient and they were treated with emollient eye drops. On referral the 6 patients with cystinosis were complaining of photophobia only and none had serious impairment of vision.

Ocular abnormalities in the 4 patients with OCRS included cataract and glaucoma; one boy had immature cataract not affecting vision and bilateral congenital chorioretinal hypoplasia. Three other cases had serious visual loss. Of these, only one boy regained relatively good vision as he underwent early eye surgery. The two boys had nystagmus during infancy, in one of whom nystagmus was not present at the time of referral. The patient with acquired cataract had severe visual impairment and was referred for surgical operation.

Table **2** summarizes the ocular abnormalities in childhood chronic renal failure.

*Address correspondence to this author at the Department of Pediatrics, P.O. Box 70025, Al Kadhimiyia, Baghdad, Iraq; Tel: 009647703930834;
E-mails: pediatrnephrolbaghdad@yahoo.com, almosawiAJ@yahoo.com

1874-303X/10 2010 Bentham Open

Table 1. Etiology of CRF

	Number of Patients	Male	Female
Hereditary disorders & syndrome	23	14	9
Glomerulonephritis	15	10	5
Congenital & obstructive uropathy	14	11	3
Undetermined	12	7	5
Neurogenic bladder & Hinman syndrome	5	4	1
Multi-systemic disease	3	1	2
Bilateral stone renal disease	3	2	1
Reflux nephropathy	2	1	1
HUS	2	1	1
Chronic PN (Recurrent UTI)	1		1
Total	80	51(63.3 %)	29(36.7%)

Table 2. Ocular Abnormalities in Childhood CRF

Ocular Abnormality	n (%)	Disorder
Corneal cystine crystals	6 (7.5%)	Nephropathic cystinosis
Congenital cataract & glaucoma	3 (3.75%)	Oculo-cerebro-renal syndrome
Congenital cataracts & chorioretinal hypoplasia	1	Oculo-cerebro-renal syndrome
Acquired cataracts	1	Hypocalcaemia
Retinopathy	2	Hypertensive retinopathy
Bilateral optic atrophy	1	Familial nephropathy associated with club feet
Proptosis	1	Membranoproliferative Glomerulonephritis
Total	15 (18.75%)	

DISCUSSION

Few literatures reported the incidence of ocular abnormalities in chronic renal failure (CRF) [1, 2]

Akinci A, *et al.* studied ocular abnormalities in 19 patients with CRF. They found dry eye symptoms in 15.8% of children with CRF. The very small number of that study was an obvious disadvantage [1]. Behbehani A detected abnormalities in 46 patients (43%) in 107 patient charts; the abnormalities had not been detected previously in 14 (13%), vision-threatening eye disorders were found in 6 (6%) of the patients [2]. Behbehani A concluded that children with CRF had a high prevalence of ocular abnormalities, but most of the abnormalities did not affect visual function.

Nephropathic cystinosis, the commonest genetic cause of CRF in this series accounted for more than one-third the ocular abnormalities observed in this study.

Cystinosis, clinically recognized since 1903, is a rare autosomal recessive lysosomal storage disease caused by mutations in CTNS. This gene codes for a lysosomal cystine transporter, whose 21 absence leads to intracellular cystine crystals, widespread cellular destruction, renal Fanconi syndrome in infancy, renal glomerular failure in later childhood and other systemic complications. Before the availability of kidney transplantation, patients affected with cystinosis uniformly died during childhood. After solid organ transplantations became successful in the 1960s, cystinosis patients survived, but eventually developed life-threatening consequences of the disease (e.g., swallowing disorders). Since the introduction of cysteamine into the pharmacological management of cystinosis, well-treated adolescent and young adult patients have experienced normal growth and maintenance of renal glomerular function [3]. However, only one of the 6 patients with cystinosis received cysteamine brought to him from outside.

Oculocerebro-renal syndrome and a severe variant of Hinman syndrome, a rare cause of CRF during childhood [4, 5], accounted for 10% of the patients in this series.

The oculocerebrorenal syndrome (OCRS), first reported by Lowe *et al*. in 1952, is a rare hereditary disease, with less than 300 cases reported in the literature. OCRS is characterized by a pleiotropic phenotype involving three major systems including ocular defects, central nervous system defects, and renal dysfunction characterized initially by Fanconi syndromeand proteinuria with later glomerular deterioration andrenal failure during the fourth decade of life [4].

Oculocerebro-renal syndrome (OCRS), which typically causes end stage renal failure (ESRD) during the fourth decade of life [6-8] caused early end stage renal failure during the first decade of life in four patients in this series, and accounted for approximately one-fourth the cases with ocular abnormalities in this study. Chorioretinal hypoplasia which has not been reported before in OCRS was present in 1 patient with OCRS. A new Iraqi variant of OCRS has been suggested previously.

Allen-Hinman syndrome (non-neurogenic bladder dysfunction) with dysfunctional bladder but no evidence of neural pathology or anatomical outflow obstruction has traditionally been believed to represent a disorder of older children and has been reported to be associated with renal failure in only five patients previously [9, 10]. We have previously reported the third series of Allen Hinman syndrome [3], one of the developed acquired bilateral cataracts in association with hypocalcaemia and non-compliance with calcium and one-alphacalciferol supplementation.

Obviously, the associated ocular abnormalities are not correlated with severity of CRF as many of the abnormalities were present before the onset of CRF.

Associated ocular abnormalities in CRF have more than one significance. Pathognomic corneal cystine crystals can

easily establish the etiologic cause of CRF. Congenital cataracts and glaucoma should alert the physician to the possibilities of genetic syndromes. Hypertensive ocular abnormalities point to the seriousness of morbid factors associated with CRF.

CONCLUSION

A unique pattern of ocular abnormalities has been reported in this series.

REFERENCES

[1] Akinci A, Cakar N, Kara N, Uncu N. Ocular findings in children with chronic renal failure. Cornea 2009; 28(1): 5-6.

[2] Behbehani A, Kraft S, Buncic JR, Levin. AV. Ophthalmic assessment of children before renal transplantation. Can J Ophthalmol 2003; 38(5): 379-84.

[3] Al Mosawi AJ. Nephropathic cystinosis in Iraqi children. N Iraqi J Med 2006; 2(2): 22-5.

[4] Al Mosawi AJ. Oculo-cerebro-renal syndrome phenotype in four Iraqi children. J Pediatr Neurol 2007; 5(1): 75-8.

[5] Al Mosawi AJ. Identification of non-neurogenic neurogenic bladder in infants. Urology 2007; 70(2): 355-6.

[6] Charnas LR, Bernardini I, Rader D, Hoeg JM, Gahl WA. Clinical and laboratory findings in the oculocerebrenal syndrome of Lowe, with special reference to growth and renal function. N Eng J Med 1991; 324: 1318-25.

[7] Foreman J. Cystinosis and Fanconi syndrome. In: Barratt TM, Avner ED, Harmon WE, Eds. Pediatric nephrology 4th ed. Lippincott, Baltimore: Williams and Wilkins 1999; pp. 593-609.

[8] Schramm L, Gal A, Zimmermann J, *et al*. Advanced renal insufficiency in a 34-year-old man with Lowe syndrome. Am J Kidney Dis 2004; 43(3): 538-43.

[9] Breuer J, Foll J, Renz-Polster H, Rebmann H, Rosendahl W, Wilbert D. [Hinman syndrome. Pronounced renal failure as a sequela of pseudo-neurogenic disorder of bladder emptying]. Monatsschr Kinderheilkd 1992; 140(3): 162-5.

[10] Jayanthi VR, Khoury AE, McLorie GA, Agarwal SK. The nonneurogenic neurogenic bladder of early infancy. J Urol 1997; 158(3 Pt 2): 1281-5.

Received: October 29, 2009 Revised: December 4, 2009 Accepted: January 16, 2010