Abnormal Ocular Findings in Chronic Renal Failure Patients on Hemodialysis

Thesis

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Aml El-Azab (2018)

List of Abbreviations

AAO	American academy of ophthalmology
ACR	Albumin creatinine ratio
ADPKD	Autosomal dominant polycystic kidney disease
AMD	Age-related macular degeneration
BCVA	Best corrected visual acuity
BUT	Break up time
CFT	Central foveal thickness
CKD	Chronic kidney disease
CRF	Chronic renal failure
CSME	clinically significant macular edema
DM	Diabetes mellitus
DME	Diabetic macular edema
eGFR	Estimated glomerular filtration rate
EOM	Extra ocular muscles
ESRD	End stage renal disease
ETDRS	Early Treatment Diabetic Retinopathy Study
GN	Glomerulonephritis
GPA	Granulomatosis with Polyangiitis
HD	Haemodialysis
HTN	Hypertension
IOP	Intra-ocular pressure
IRMA	Intraretinal microvascular abnormalities

MPA	Microscopic Polyangitis
NPDR	Non proliferative diabetic retinopathy
NSAIDs	Non steroidal anti-inflammatory drugs
NSRD	Neurosensory retinal detachment
NVD	New vessels on optic disc
NVE	New vessels elsewhere
OCT	Optical coherence tomography
OPP	Ocular perfusion pressure
PDR	Proliferative diabetic retinopathy
PHO	Primary hyperoxaluria
PTDs	Post trachomatous degenerations
RNFL	retinal nerve fiber layer
RPE	retinal pigment epithelium
SD	Standard deviation
SD-OCT	Spectral domain optical coherence tomography
SLE	Systemic lupus erythematosus
SPSS	Statistical Package for Social Science
SRD	Serous retinal detachment
TINU	Tubulo-interstitial Nephritis and Uveitis Syndrome
USRDS	United States Renal Data System
VA	Visual acuity
VMT	Vitreo-macular traction

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ABSTRACT

Background: chronic kidney disease (CKD) is a global public health problem and diabetes is a leading cause for it. Those patients with end-stage renal disease (ESRD) are generally treated using hemodialysis (HD). HD causes numerous metabolic changes which in turn induce osmotic changes in blood and extracellular fluids including the aqueous and vitreous humor, so there are many ocular abnormalities in ESRD patients either due to common pathophysiological mechanisms and risk factors between eye and kidney diseases or due to hemodialysis itself. **Aim of the Work:** the aim of this study is to evaluate ocular findings in CKD patients on hemodialysis, including the best-corrected visual acuity (BCVA), measurement of intraocular pressure (IOP), corneal, conjunctival, tear film changes, lens and fundus changes. **Patients and Methods:** this cross sectional observational study was carried out on twenty three patients (6 males and 17 females) with 44 eyes, with chronic kidney disease on chronic hemodialysis for 2-10 years in the Dialysis Unit at Agouza Specialized Hospital in the period from November 2017 to April 2018. The hemodialysis duration was approximately four hours three times per week. **Results:** forty three percent of total 44 eyes had BCVA > 6/18. As regard anterior segment, we found yellow sclera was the commonest finding (75%), cataract (61.4%), lid edema (56.8%), dry eye (43.2%), conjunctival congestion (47.7%), and pterygium (13.6%). As regard posterior segment; Diabetic retinopathy was the commonest finding (38.6%), hypertensive retinopathy (4.5%), AMD (2.3%), macular hemorrhage (2.3%). Regarding OCT findings, there was statistically significant difference between eyes of diabetic, hypertensive and other patients as regard central foveal thickness. **Conclusion:** our results demonstrate high prevalence of abnormal ocular findings in chronic renal failure patients on hemodialysis. So those patients should be evaluated regularly by the ophthalmologist.

Keywords: Chronic Renal Failure, Hemodialysis, Ocular Findings, Central Foveal Thickness, OCT

Introduction

Chronic kidney disease (CKD) is a slow progressive loss of kidney function over a period of several years, which also is the presence of either reduced renal function as evaluated by estimated glomerular filtration rate (eGFR <60 ml/minute/1.73 m^2) or albuminuria evaluated by urinary albumin to creatinine ratio (ACR ≥30 mg/g) **(1)**.

Chronic kidney disease has become a major public health problem worldwide and has been associated with premature morbidity and mortality **(2)**.

Chronic kidney disease has numerous causes. The most common causes of CKD are diabetes mellitus and long-term uncontrolled hypertension **(3)**. Overuse of common drugs such as ibuprofen, acetaminophen can also cause chronic kidney disease **(4)**.

Chronic renal failure patients have had a wide range of findings, including refractive changes, dry eye, increased tear osmolarity, conjunctival calcium deposits, band keratopathy, corneal endothelium changes and lenticular opacity **(5)**.

Patients with chronic kidney disease are generally treated using a blood filtration mechanism such as hemodialysis. The primary objective of hemodialysis is to correct the composition and volume of body fluids. Correction of body fluid aims to resolve the excessive accumulation and abnormal distribution of body fluids and

is concerned with the change in plasma colloid osmotic pressure during haemodialysis [(6)].

Although hemodialysis is relatively effective, it has certain impairments that persist over time and many patients experience multi-organ changes. Hemodialysis usually reduces body weight and blood pressure and increases the plasma/interstitial osmotic pressure in patients with ESRD [(7)].

During hemodialysis, numerous metabolic parameters including blood urea, sodium, potassium and sugar will be changed [(8)], which also induce osmotic changes in blood and extracellular fluids. This includes the aqueous and vitreous humor, any change in osmotic pressure of these fluids could affect the refractive status [(9)].

The relationship between chronic hemodialysis and intra-ocular pressure (IOP) has been widely investigated in the past. There are several studies, which demonstrate a significantly increased IOP and decreased OPP occur during HD, bringing both to levels that increase the risk of glaucoma development and progression [(10)]. In contrast, other studies have demonstrated the opposite effect [(11)], while some studies reported no IOP change during HD [(12)].

Ocular posterior segment changes such as, retinopathy secondary to diabetes mellitus, hypertension, anemia, and uremia, are also observed frequently in CRF patients [(13)].

Pahor et al. found that CFT was significantly thinner in hemodialysis patients than normal healthy subjects [(14)].

Aim of the work

The aim of this study is to evaluate abnormal ocular findings in CKD patients on hemodialysis, including the best-corrected visual acuity (BCVA), measurement of intraocular pressure (IOP), corneal, conjunctival, tear film changes, lens and fundus changes.

Ocular Manifestations of CRF and Effect of Hemodialysis on The Eye

The eye shares striking structural, developmental and genetic pathways with the kidney, suggesting that kidney disease and ocular disease may be closely linked. Richard Bright, an early pioneer in morbid anatomy and clinical signs and symptoms of kidney disease first reported the association between renal disease and blindness in 1836 [(15)].

Renal microvascular pathology is thought to play an important role in the development of renal insufficiency. The assessment of renal vascular pathology requires invasive procedures. The retinal vasculature, conversely, can be observed non-invasively in humans and therefore offers a unique opportunity to explore the association between systemic microvascular disease and renal function. These organs share pathophysiological mechanisms, such as endothelial dysfunction and the inflammatory process, leading to circulatory abnormalities and decreased vascular reactivity [(16)].

We are going to discuss abnormal ocular findings associated with hemodalysis:

1- Refractive state:

Hemodialysis patients, especially the elderly, have visual acuity (VA) levels much lower than their age-matched counterparts [(17)].