

Ocular Manifestations in Hemodialysis Patients

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I. Introduction:

Chronic kidney disease (CKD) has become a worldwide public health issue, with increase in incidence, prevalence, poor prognosis and high healthcare costs. End-stage renal disease (ESRD) refers to the fifth stage of disease and is the final outcome of disease progression in CKD patients. Patients with ESRD are generally treated with a blood-filtration mechanism, such as hemodialysis (HD), which removes excess fluid and metabolic waste from the extracorporeal blood so as to provide the electrolyte and acid-base balance. Hemodialysis (HD)-associated ocular abnormalities are one of main causes of ocular morbidity among patients with ESRD. This study evaluates the frequency of ocular abnormalities in end-stage renal disease (ESRD) patients undergoing HD and to evaluate their risk factors.

II. Patients And Methods:

A cross-sectional study was conducted at the ophthalmology department of 20 Aout 1953 teaching hospital of Casablanca, Morocco from January 2017 to September 2019. All ESRD patients >18 years undergoing regular HD referred to the ophthalmology department were included in the study. Medical histories of each patient including age, gender, family history, medication history, and duration of HD were collected using a structured check list. A complete ophthalmologic examination was performed for each patient. Paraclinical exams including fluorescein angiography and macular ocular coherence tomography were prescribed according to the slit lamp examination findings.

III. Results:

In total, 92 patients, including 54, 34 % females, with ESRD undergoing regular HD were recruited. The mean \pm SD age of the patients was 42.50 ± 13.20 years. The mean \pm SD duration of dialysis was 5.40 ± 2.75 years in the patients. Only 14.13% of cases had detailed eye checkup including fundus evaluation in the past. The most prevalent etiology for HD was hypertension (HTN) followed by diabetes mellitus (DM). The most important ocular symptom was blurring vision in 84, 72 % cases.

The mean BCVA was 2/10. The mean IOP after HD session was 12.68 mmHg with SD 1.92 mmHg ranging from 10 to 18 mmHg. There was statistically significant difference among those who had DM, HTN and other groups as regard the mean IOP.

Conjunctival calcification were found in 32.10% of the cases. A significant relationship was identified between conjunctival calcification and HD duration ($p < 0.001$).

Regarding abnormal anterior segment ocular findings, cataract was the most common in 38.05% cases. There was statistically significant difference between diabetic, hypertensive and others as regard cataract. Dry eye was found in 20.65% cases with no statistically significant difference between different groups.

The average TBUT results decreased from 9.65 ± 4.43 sec to 8.93 ± 4.78 sec after HD, and was statistically significant ($p < 0.001$). The mean Schirmer I Test results decreased from 13.99 ± 5.67 mm to 11.07 ± 3.11 mm after HD. The decline in the Schirmer I Test results was statistically significant ($p = 0.005$).

The most important and vision threatening were the posterior segment lesions found in 76.09% eyes. Diabetic retinopathy was the most common with 23.91% of proliferative DR with cystoid macular edema cases. 10.87% eyes had hypertensive retinopathy 8eyes had age related macular degeneration. Macular hemorrhage was found in 3 eyes of hypertensive patient.

No significant relationship was noted between glaucoma, cataract, proliferative diabetic retinopathy, optic atrophy and hypertensive retinopathy and HD duration. ($p=0.441$, $p=0.33$, $p=0.712$, $p=0.654$, $p=0.142$ respectively)

IV. Discussion:

The number of patients on HD has increased significantly worldwide. The primary etiology of ESRD is different and contentious. Sun et al. claim that glomerulonephritis, diabetic nephropathy and hypertensive nephropathy are the three highest hazard in ESRD patients(1), while Chelala and Tow found diabetic nephropathy to constitute the greatest risk in chronic kidney disease(2). Ismayilov et al found that hypertensive nephropathy, diabetic nephropathy and polycystic kidney disease represented the greatest risk in ESRD patients(3)

One of the common ocular findings included conjunctival calcification. The reported incidence of ocular complications in different studies varies from 5% to 62.5%. Chen et al. reported corneo-conjunctival calcification in 48.89% of the 45 HD patients in their study(4) while Geneva reported that 66% of patients presented with corneo-conjunctival deposits(5). The theory suggests that higher serum calcium and phosphorus concentrations as a result of tertiary hyperparathyroidism can perhaps lead to corneal and conjunctival calcification(6). Since this abnormal imbalance is a common finding in HD patients, ectopic calcification is believed to be the cause of inflammatory reactions.

In our study, dry eye was found in 20.65% cases with no statistically significant difference between different groups. Ebana Mvogo et al. found that 27.1% of HD patients developed lacrimal hyposecretion(7); while Kal et al. found that tear meniscus depth, tear meniscus area and tear meniscus height were lower in patients with ESRD (8). A raised urea level in tears and decreased tear secretion after HD causes an increase in tear osmolarity. Hyperosmolarity aggregates inflammatory process in epithelial cells, as well as the inflammatory cytokines and matrix metalloproteinases (MMPs).

In the present study, the mean IOP declined after HD. Tokuyama et al. reported IOP reduction to be related to the ultrafiltration rate by means of the albumin level(9). Underestimations of IOP values after HD can occur due to decreases in the central corneal thickness induced by fluid loss. Jung et al. reported a significant decrease in central corneal thickness during HD, and found that CMT and IOP changes were positively correlated(10). In early-period HD, a different mechanism comes into play. In HD patients with narrow angles, neovascular glaucoma, a peak in IOP may be observed after HD, and associated with this mechanism, a quick decrease in plasma osmolarity during HD results in an osmolar gradient between the plasma and ocular tissue that provokes a shift of fluid into the ocular tissue(11).

Diabetic retinopathy is one of the most common and serious ophthalmic problems in patients with renal disease. Unique ocular abnormalities were found in patients who progressed toward diabetic retinopathy, including proliferative diabetic retinopathy, vitreous hemorrhage, and diabetic macular edema, which is compatible with the present findings of Kianersi et al(12)

V. Conclusion:

The results show high prevalence of abnormal ocular findings in chronic renal failure patients on hemodialysis which need close follow by the ophthalmologist. The results of this study highlight the need for periodic ophthalmological examinations to determine the presence of HD-associated ocular manifestations and prevent their related complications.

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