CHAPTER 1

INTRODUCTION AND SYMPTOMS

Introduction of Diabetic Retinopathy

Diabetic retinopathy (DR) is a potentially blinding complication of diabetes. It is defined as presence of one or more definite microaneurism or any other more severe lesion formed in any stage of retinopathy. Retinopathy frequently appears after 5 years of untreated diabetes and 50% of patients have some evidence of it in less than 10 years. At first, there is no changes in your vision and could get worse over the years and threaten your vision. With timely treatment, 90% of those with advanced diabetic retinopathy can be saved from going blind. Everyone with diabetes should have an eye examination through dilated pupils at least once a year. DR occurs when diabetes damages the tiny blood vessels inside the retina, the light sensitive tissue at the back of the eye. At this point, most people do not notice any changes in their vision. Some people develop a condition called macular oedema. It occurs when the damaged blood vessels leak fluid and lipids on to the macula, the part of the retina. The fluid makes the macula swells and blurring of vision takes place. As the disease progress it enters an advanced proliferative stage. Retinopathy before the development of retinal neovascularization is termed nonproliferative diabetic retinopathy (NPDR). Once proliferation of new retinal vessel occurs, it is referred to as proliferative diabetic retinopathy (PDR)[1].

In 1967, in his magnum opus *"The system of Ophtalmology, Sir Stewart Duke-Elder had written,"....diabetic retinopathy is one of the major tragedies of ophthalmology in our present generation; always common and rapidly becoming still more common; affecting the young as well as the aged, predictable but not preventable."*

Stages and Symptoms of Diabetic Retinopathy

There are four stages of diabetic retinopathy these are;

1. **Mild Nonproliferative Retinopathy (NPDR):** It is earliest stage of retinopathy and at this stage balloon like swelling takes place in the small area of retinal blood vessels.
2. **Moderate Nonproliferative Retinopathy:** It is the second stage and at this stage some blood vessels nourish the retina get blocked.
3. **Severe Nonproliferative Retinopathy:** At this third stage more blood vessels get blocked.
4. **Proliferative Retinopathy (PDR):** At this advanced stage due to retinal ischemia, hypoxic condition occur and a signal sent by the retina for nourishment, cause the growth of new blood vessels, this condition is called neovascularization. These newly formed blood vessels have fragile and thin walled, leak the blood on the surface of eye and blindness takes place. Retinal neovascularization, a hallmark of proliferative diabetic retinopathy (PDR), is a major risk factor for severe vision loss in patients[2]. Depending on the degree and severity of retinal new vessels, presence of vitreous or pre-retinal hemorrhage and retinal detachment, PDR can be categorized as nonproliferative diabetic retinopathy (Pericyte loss, basement membrane thickening, vascular leakage, alteration in blood flow, tissue hypoxia), preproliferative diabetic retinopathy (Hypoxia, oedema, microaneurysms, soft exudates, venous beading) and proliferative diabetic retinopathy (Angiogenesis, fibrovascular ridge, breakdown of inner blood-retinal barrier, retinal detachment, blindness). The various stages and their symptoms were shown in Table 1.1 and Figure 1.1.

Table 1.1 Clinical stages and symptoms of diabetic retinopathy.

S. No.	Disease Level	Lesions Finding
1	No apparent retinopathy	No abnormalities.
2	Mild NPDR	Microaneurysm only.
3	Moderate NPDR	More than just microaneurism but less than severe NPDR
4	Severe NPDR	No sign of PDR, with any of the following: Intra retinal hemorrhages, venous beading and intra retinal microvascular anomalies.
5	Low-risk PDR	New vessels elsewhere>0.5 disc area in 1 or more quadrants.

Contd…

S. No.	Disease Level	Lesions Finding
6	Moderate-risk PDR	New vessels elsewhere≥0.5 disc area in 1 or more quadrants or new vessels on disc <0.25-0.33 disc area either new vessels on disc.
7	High-risk PDR	<0.25-0.33 disc area or new vessels elsewhere <0.5 disc area and vitreous hemorrhage. New vessels on disc ≥0.25-0.33 disc area (with or without vitreous hemorrhage). New vessels elsewhere > 1 disc area (with or without vitreous hemorrhage).
8	Advanced PDR	Traction, retinal detachment, rubeosisiridis, fundus partially obscured.

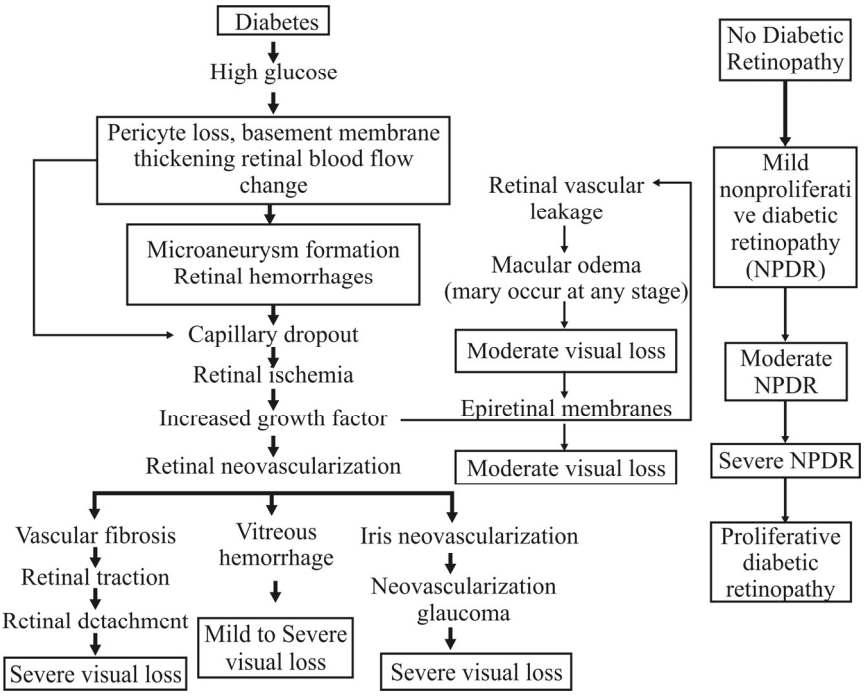

Fig. 1.1 Various stages and their symptoms of diabetic retinopathy.

In DR elevated level of $HbA_{1\propto}$ and reduced level of 2, 3-diphosphoglycerate decreased the release of O_2 from Hb which causes retinal hypoxia and ischemia. In early stage retinal ischemia is reversible

and becomes irreversible if blood-retinal barrier breaks and tight endothelial junctions open up. The break down of blood retinal barrier is related to duration and severity of diabetes mellitus. Initially, in uncontrolled diabetes mellitus, there is compensatory increase in retinal blood volume and segmental blood flow along with auto regulatory dilation of retinal blood vessels. With development of diabetic retinopathy there is regional hyper perfusion of retina due to removal of floating matter where RBCs shunted through some capillaries and plasma alone. Eventually, severity of retinal hypoxia increases microaneurism, cotton-wool spot, new vessel formation (proliferative retinopathy), intra retinal oedema and hemorrhage. Thus, retinal manifestations of diabetes are- Microaneurysms (MA), Haemorrhages (H), Soft exudates (SE), Hard exudates (HE), Venous beading (VB), Intra retinal microvascular anomalies (IRMA), Neovascularisation elsewhere (NVE), Neovascularisation of the optic disc (NVD), Clinically significant macular oedema (CSME)[3].

Epidemiology

The biggest risk factor for diabetes is diabetes itself. The Indian figures for the prevalence of diabetic retinopathy vary from 4 to 28%. The WHO multinational study of vascular disease in diabetes estimated the prevalence of diabetic retinopathy in males and females as 6.25% and 4.5% respectively. In population study at a South Indian urban setting retinopathy was found in 87.55% of diabetes with duration more than 15 years compared to 18.9% in those with duration of disease less than 15 years. The incidence of the severity of diabetic retinopathy as seen in the South Indian study among recently detected diabetes revealed non-proliferative diabetic retinopathy at 30.8% including 6.4% with maculopathy and proliferative diabetic retinopathy at 3.4%. In a population based assessment of diabetes and diabetic retinopathy, the age-sex adjusted prevalence of diabetes among people aged 50 years and over was 5.1% and of diabetic retinopahy among diabetes was 26.8% with non-proliferative retinopathy being the most common form (94.1%). Puberty and pregnancy can accelerate retinopathy progression. The onset of vision-threatening retinopathy is rare in children before puberty regardless of the duration of diabetes. However, if diabetes is diagnosed between the ages of 10 and 30 years, significant retinopathy may arise within 6 years of the disease. Proliferative retinopathy is present in 25% of the patients with type 1 and the duration of 15 years but in 25% of the

type 2 diseases at duration of 25 years. However, in type 2 diseases with less than five years proliferative retinopathy develops in 2% only. The prevalence of macular oedema is approximately 18 to 19% in patients either with type 1 disease or type 2[4].

Diabetes is one of the most serious challenges to health care world-wide. According to recent projections it will affect 239 million people by 2010 doubling in prevalence since 1994. Diabetes will affect 28 million in Western Europe, 18.9 million in North America, 138.2 million in Asia and 1.3 million in Australia. The prevalence of blindness due to DR in Western Communities is estimated as between 1.6-1.9/ 100,000 about 8% of UK registrations are due to diabetes. Diabetes mellitus is the most common cause of blindness amongst individuals of working-age (20-65 years).

References

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