

Diabetic Quick Reference

Diabetes is characterised by sustained hyperglycaemia secondary to lack or diminished efficacy of endogenous insulin. There are two main types of Diabetes:

- Insulin dependent Diabetes (IDD) - Type 1 - which develops usually between the ages of 10 - 20 years, although adults can also become insulin dependent.
- Non insulin dependent Diabetes (NIDD) - Type 2 - which usually develops between 50 to 70 years of age.

Diagnostic criteria for Diabetes Mellitus

- Fasting plasma glucose (FPG) > 126mg/dl (7.0mmol/l)
- Random plasma glucose (RPG) > 200 mg/dl (11.1mmol/l)

Diabetes occurs as microvascular (small blood vessels of the body) and macrovascular (large blood vessels of the body) systemic complications.

Eye complications of Diabetes

- Reduced corneal sensitivity, recurrent corneal erosions, delayed corneal wound healing.
- Recurrent styes and blepharoconjunctivitis, Xanthelasma associated with hyperlipidaemia
- Neovascularization of the iris (rubeosis iridis)
- Sluggish pupillary reflexes- autonomic neuropathy partially denervating sphincter and dilator muscles.
- Fluctuations in refractive error
- Cataracts
- Optic Atrophy
- Ischemic optic neuropathy
- Cranial neuropathies III, IV or VI
- Acute disc oedema and macula oedema
- Retinopathy

Pathogenesis of Diabetic Retinopathy

Microangiopathy affects the retinal precapillary arterioles, capillaries and venules- leading to occlusion causing ischemia and leakage. Abnormal vascular permeability leads to oedema. In the diabetic eye, the basement membrane becomes thickened and vacuolised, a loss of pericyte nuclei leading to a weakening and closure of the capillaries which gives fundoscopic changes.

Diabetic Retinopathy Clinical Stages

1. No Diabetic Retinopathy- normal health fundus.
2. Background Diabetic Retinopathy
 - Microaneurysms - Retinal microaneurysms are usually the first sign of diabetic retinopathy and are located within the inner nuclear layer in capillaries linking the superficial and deep capillary network. They range in diameter from 12 to 100 μm but only those greater than 30 μm in diameter can be seen with an ophthalmoscope.
 - Haemorrhages - Ruptured microaneurysms, capillaries and venules are all sources of intraretinal haemorrhages, which are mostly located within the outer plexiform and inner nuclear layers. Deep haemorrhages are dots and blots while superficial ones in the nerve fibre layer are flame-shaped. A predominance of flame-shaped haemorrhages points to the presence of venous obstruction or arterial hypertension.
 - Hard Exudates - Extracellular collections of macrophages within the outer plexiform layer, derived from ingested leaked lipid & proteins from the abnormal vessels. They are yellowish and vary in size. They may be confluent or arranged in a circinate pattern around a cluster of microvascular abnormalities. Scattered hard exudates often come and go, but continued focal leakage will result in plaques that can cause permanent functional impairment if located on the fovea.
 - Retinal Oedema - Fluid collects initially between the outer plexiform and inner nuclear layer; secondary oedema appear between the inner plexiform and nerve fibre layers. Retinal thickening obscures the retinal pigment epithelium and choroidal layers.
3. Proliferative Diabetic Retinopathy
 - Vascular changes - Narrow arterioles and venous changes - beading, looping and sausage like segmentation & venous dilation.
 - Dark Blot haemorrhages - Haemorrhagic nerve fibre layer infarcts.
 - Cotton wool spots - Superficial, white, fluffy edged patches resulting from focal abnormalities of axoplasmic transport in the nerve fibre layer due to localized capillary ischaemia. Large numbers of them may signify the presence of arterial hypertension.
 - Intraretinal microvascular abnormalities (IRMA) - Intraretinal neovascularization, irregular dilatations of segments of the capillary bed causing shunts.

⇒ Vascular changes, Blot & Dot haemorrhages and Cotton Wool spots are an indication of severe retinal ischemia.

Diabetic Retinopathy Clinical Stages cont'd.

4. Proliferative Diabetic Retinopathy

- Neovascularization- Neovascularization originating from the disc, retina or iris is the hallmark of proliferative retinopathy. New vessels can grow across the surface of the retina or on the posterior vitreous face, when they may be associated with fibrous tissue seen as gliotic bundles. New Vessels at the Disc and New Vessels Elsewhere on the retina are the two main categories.
- Vitreous detachment- In the presence of a detached vitreous (as occurs in many elderly people) subsequent new vessel growth is limited to focal raspberry-like lesions without fibrosis. Small haemorrhages into the vitreous cause 'floaters', whereas more extensive vitreous haemorrhage can cause sudden and painless loss of vision.
- Haemorrhages - Neovascular fronds can result in pre-retinal or vitreous haemorrhages. Pre-retinal haemorrhage is seen as localised boat-shaped or crescent-shaped haemorrhage between the posterior hyaloid face and the internal limiting membrane of the retina.

Advanced proliferative disease is characterized by fibrovascular proliferation and contraction that can lead to continued vitreous haemorrhage and tractional retinal detachment. Rubeosis iridis- (a part of advanced diabetic eye disease) new blood vessel formation in the iris leads to secondary glaucoma.

Complications of Proliferative diabetic retinopathy

- Vitreous haemorrhage
- Retinal detachment
- Opaque membranes
- The burnt out stage
- Rubeosis Iridis- Glaucoma

5. Maculopathy

- Macular Oedema – abnormal vascular permeability can occur at any stage of Diabetic Retinopathy and is evaluated separately. It is one of the leading causes of visual loss in Diabetics. The Early Treatment of Diabetic Retinopathy Study (ETDRS) defines:
 1. Thickening of the retina with 500 microns (approx. 1/3 of a disc diameter) and includes the foveal centre.
 2. A large zone of retinal thickening (1 disc diameter or larger) any part of which is within 1DD of the foveal centre.
 3. Hard Exudates (lipid) associated with retinal thickening within 500 microns of the centre of the macula.

Treatments

1. Argon Laser PRP
2. Cryotherapy
3. Vitrectomy
4. Avastin- used during acute haemorrhage- the retina is obscured by blood
5. Intravitreal Triamcinolone Acetonide- macula oedema
6. Future : C- Peptide

References

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Diabetic Vision Report

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Date:

GP/Ophthalmologist/Diabetic Clinic/Internal Medicine/Paediatrics

RE: _____ Telephone No: _____
DofB _____ MCP No: _____

Last Diabetic Check:
Recent Sugar reading/A1c:
Medications:

Diagnosis:
Systemic Conditions:

Reason for eye examination: Routine/ Probs

Uncorrected Vision R 6/ 20/ L 6/ 20/ Bino 6/ 20/ Near R ___ L ___ Bino ___
Corrected Vision R 6/ 20/ L 6/ 20/ Bino 6/ 20/ Near R ___ L ___ Bino ___

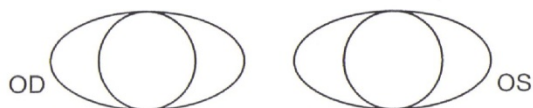
Refraction: R: _____ Add _____
L: _____

IOP: **T** Time:
Visual Fields:

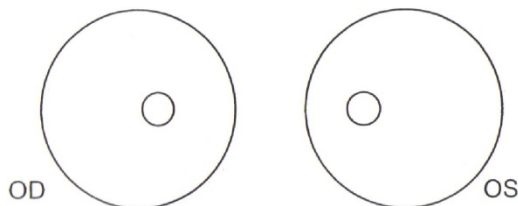
Ophthalmoscopy

Dilated/Undilated

External:



Internal:



No Diabetic Retinopathy/ Background/ Preproliferative/ Proliferative/ Maculopathy
Referral/ Review _____

Visual Acuity Equivalents

Distance Vision Tests

Meter 6/	Feet 20/	LogMAR	Snellen Decimal	Percent	Letter size mm @ 6m
3	10	-0.3	2.0	200	4.4
4	13	-0.18	1.5	150	5.8
4.5	15	-0.12	1.33	133	6.5
5	17	-0.08	1.2	120	7.3
6	20	0	1.0	100	8.7
7.5	25	0.1	0.8	80	10.9
9	30	0.18	0.67	67	13.1
9.5	32	0.2	0.63	63	13.8
12	40	0.3	0.5	50	17.4
15.1	50	0.4	0.4	40	21.9
18	60	0.48	0.33	33	26.2
19	63	0.5	0.32	32	27.6
23	75	0.57	0.27	27	32.7
24	80	0.6	0.25	25	34.9
30	100	0.7	0.2	20	43.6
36	120	0.78	0.17	17	52.4
60	200	1.0	0.1	10	87.3
75	250	1.1	0.08	8	109.1
120	400	1.3	0.05	5	174.6
150	500	1.4	0.07	4	218.3
240	800	1.6	0.03	3	349.5

Near Visual Acuity Tests

Example	Jaegar	N point	Snellen
Medicine Bottles	1	3.5	20/20
Bible	2	4.5	20/25
Phonebook	3	6	20/40
	4	7	
	5	7.5	
Newsprint	6	8	20/50
Textbook	7	10	20/70
9-12yr old books	8	12	20/80
	10	10	
8-9 yr old books	11	14	20/100
7-8 yr old books	13	18	20/150
Large print books	14	20	20/170

Diabetic Facts

- ▶ Over 38,000 people have diabetes in Newfoundland and Labrador.
- ▶ It is estimated that another 17,000 people have diabetes but do not know it.
- ▶ Newfoundland and Labrador has a Diabetic prevalence of 6.4 % compared to the National rate of 4.2% (1 in every 13 people.)
- ▶ The Province also has the highest rate of Type 1 Diabetes in the Country. It is estimated by 2016, the direct Provincial costs for caring for those with diabetes will exceed \$135 million! Health Survey 2005

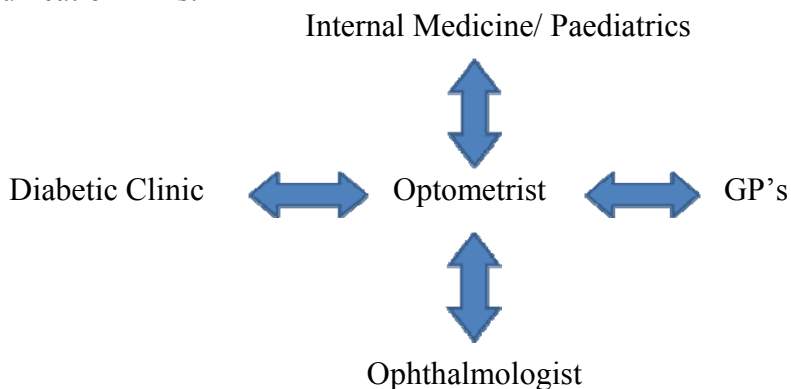
Why the Eyes are Important!

- ▶ The prevalence of Diabetes is increasing & it will overwhelm the healthcare system- the cost of Diabetic complications far outweighs the cost of managing Diabetes.
- ▶ Diabetes is a multi-organ disease- long term complications include: Neuropathy, Renal Failure, Amputations, Strokes, Heart Disease, Retinopathy and Maculopathy!
- ▶ Diabetic Changes in the eyes are directly related to complications in the body's key systems.

Diabetic Vision Report

Information

Communication links:



Goals

- ▶ Strengthening health care links by improving the lines of communication in the local area.
- ▶ Enhancing Patient care by increased monitoring and exchange of information.
- ▶ To convey the knowledge & understanding of Diabetes and how it specifically affects the eye.
- ▶ Increase patient awareness of the effects of Diabetes- a change in behaviour and mind set!
- ▶ Reduce Long- Term Health and Social costs associated with severe vision loss.

The single most important risk factor is the



length of time the Patient has had Diabetes!

Time....

- ▶ 1/3 of Diabetics have Diabetic Retinopathy
- ▶ It is now the most common cause of blindness under age 65, and the most common cause of new blindness in North America.
- ▶ Many patients with Retinopathy do not have any warning symptoms in the early stages of the disease.
- ▶ Routine Eye Examinations are the best method of detecting and preventing vision loss.

Retinopathy

- ▶ Type 1 patients do not usually develop retinopathy until at least 5 years after the onset of the disease.
- ▶ After 15 years with diabetes, however, 98% of patients demonstrate some retinopathy.
- ▶ In Type 2 Diabetes, the development of retinopathy happens rapidly.
- ▶ 1/5 of Type 2 patients show signs of retinopathy when their Diabetes is 1st diagnosed.
- ▶ Ultimately, Diabetes will cause changes in the eyes for 78% of Type 2 patients

Newfoundland & Labrador Statistics

- ▶ In 2004/05, diabetes prevalence for individuals aged 65 years and older (10%) was approximately 3x that of the 35-64 year age group (3%).
- ▶ The prevalence of diabetes ↑ with ↑ age, and as a result, 1 in 4 adults over the age of 65 have diabetes.
- ▶ The age-standardized diabetes prevalence has ↑ each year since 2000/01, and has consistently been higher among ♂ than ♀.
- ▶ Co-morbidities (defined as coexisting medical conditions, for heart disease, stroke/hypertension, and renal/kidney disease) are 5 to 11 times higher among adults living with diabetes compared to those without. Heart failure,

for example, is nearly 8x higher among those with diabetes compared to those without.

- ▶ Health service utilization (hospital stays/physician visits) is generally higher among those with diabetes than among those without. Overall, the length of hospital stay is approximately 4x as high and the number of physician visits 2x as high among those with diabetes compared to those without.
- ▶ In 2004/05, the mortality rate among those with diabetes was approximately 2x that among those without.

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