

Diabetes Complications

DG van Zyl

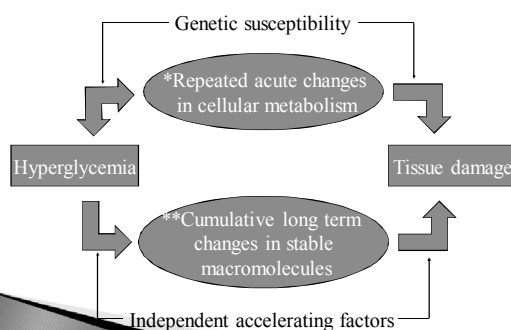
The Ticking Clock



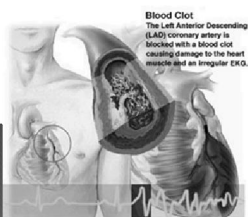
Different Diabetes Complications

- Macro vascular
- Micro vascular
- Neuropathy
- Infections

Mechanisms

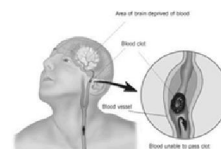


Macro vascular Complications



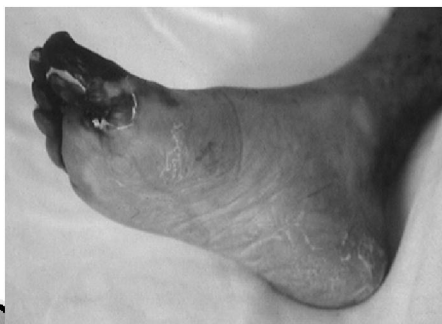
Macro-vascular Complications

- Ischemic heart disease
- Cerebrovascular disease
- Peripheral vascular disease



Diabetic patients have a 2 to 6 times higher risk for development of these complications than the general population

Peripheral Vascular Disease



Macro-vascular Disease

Once clinical macro-vascular disease develops in diabetic patients they have a poorer prognosis for survival than normoglycemic patients with macrovascular disease

The protective effect females have for the development of vascular disease are lost in diabetic females

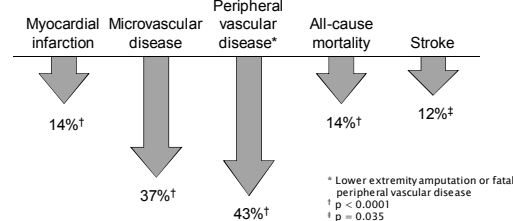
Macro-vascular Complications

The major cardiovascular risk factors in the non-diabetic population (smoking, hypertension and hyperlipidemia) also operate in diabetes, but the risks are enhanced in the presence of diabetes.

Overall life expectancy in diabetic patients is 7 to 10 years shorter than non-diabetic people.

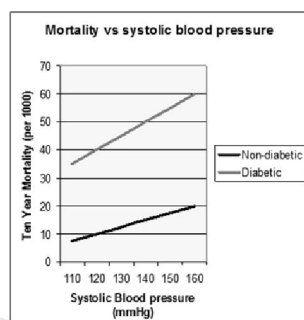
Treatment of hyperglycaemia reduces the risk of complications in diabetic patients

Each 1% reduction in HbA_{1c} reduces the risk of:



Stratton IM, et al. BMJ 2000; 321: 405-11

Effect of Hypertension



Goals of Treatment of Hypertension

Lower target for diabetic patients than non-diabetic patients:

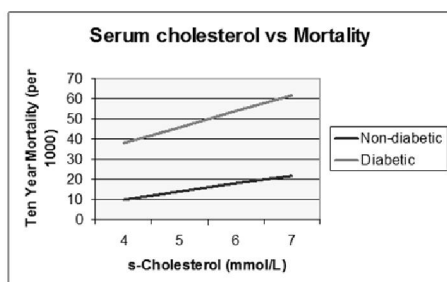
130/80 vs. 140/90

If nephropathy is present the target should be

≤120/70

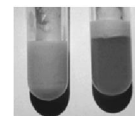
UKPDS 38. BMJ 1998;317:703-13
 HOT. Lancet 1998;351:1755-1762

Effect of Cholesterol



Dyslipidaemia in DM

- ▶ Most common abnormality is ↓ s HDL and ↑ s Triglycerides
- ▶ A low HDL is the most constant predictor of CV disease in DM
- ▶ Target lipid values: LDL < 2.6 mmol/l, HDL > 1.15 mmol/l, TG < 2.5 mmol/l



Stop Smoking



Infections in Diabetes

Infections

- ▶ The association between diabetes and increased susceptibility to infection in general is not supported by strong evidence
- ▶ However, many specific infections are more common in diabetic patients and some occur almost exclusively in them
- ▶ Other infections occur with increased severity and are associated with an increased risk of complications

Infections (cont)

- ▶ Several aspects of immunity are altered in patients with diabetes
- ▶ There is evidence that improving glycemic control patients improves immune function

Specific Infections

- Community acquired pneumonia
- Acute bacterial cystitis
- Acute pyelonephritis
- Emphysematous pyelonephritis
- Perinephric abscess
- Fungal cystitis
- Necrotizing fasciitis
- Invasive otitis externa
- Rhinocerebral mucormycosis
- Emphysematous cholecystitis

Rhino-Cerebral Mucormycosis



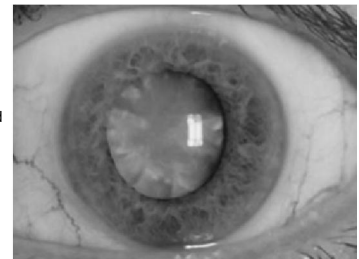
Eye Complications

Eye Complications

‣ Cataracts

Non enzymatic glycation of lens protein and subsequent cross linking

Sorbitol accumulation could also lead to osmotic swelling of the lens but evidence of involvement in cataract formation is less strong



Diabetic Retinopathy (DR)

- DR is the leading cause of blindness in the working population of the Western world
- The prevalence increase with the duration of the disease (few within 5 years, 80 – 100% will have some form of DR after 20 years)
- Maculopathy is most common in type 2 patients and can cause severe visual loss

Eye Complications

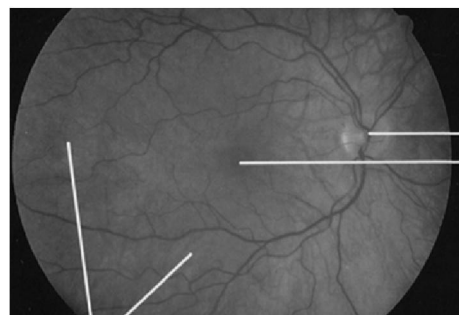
Retinopathy (stages)

- Background
- Pre-proliferative
- Proliferative
- Advanced diabetic eye disease
- Maculopathy
- Glaucoma

Risk factors for DR/ worsening of DR

- › Duration of DM
- › DM type 1
- › Poor glycaemic control
- › Hypertension
- › Diabetic nephropathy
- › Recent cataract surgery
- › Pregnancy
- › Alcohol
- › Smoking

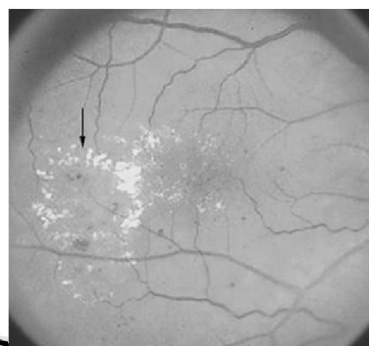
Normal Retina



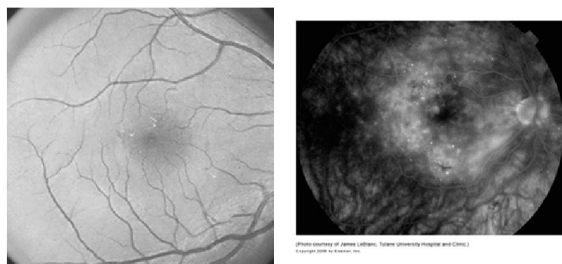
Background / Non-proliferative retinopathy



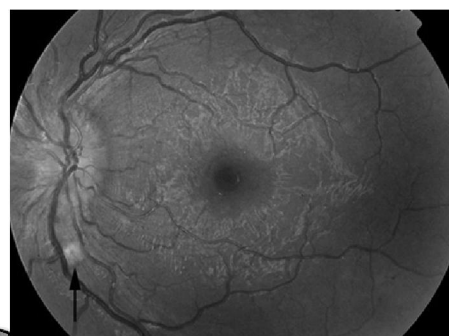
Background retinopathy



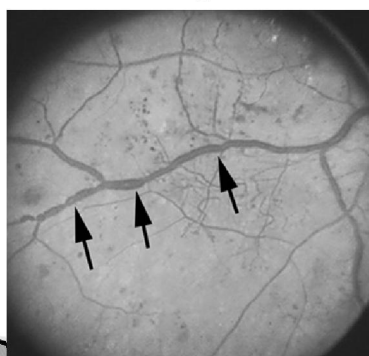
Macular edema



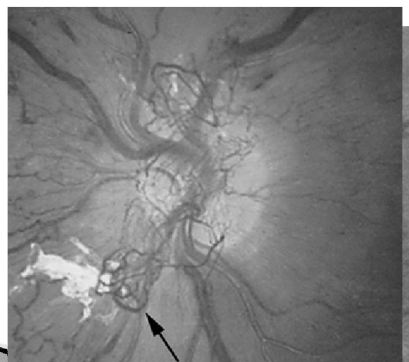
Advanced Non-Proliferative DR



Venous Beading & IRMA



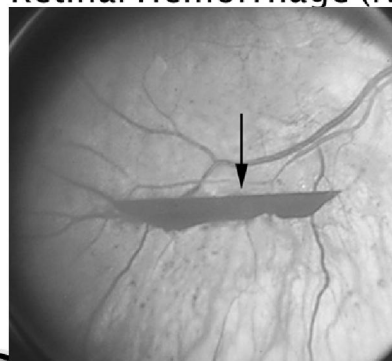
NVD



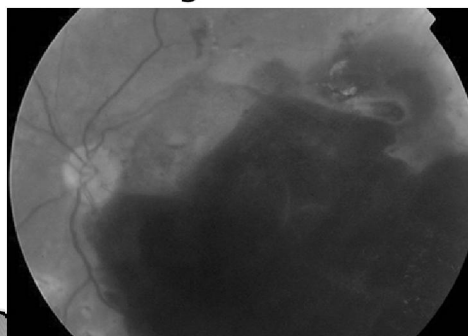
NVE



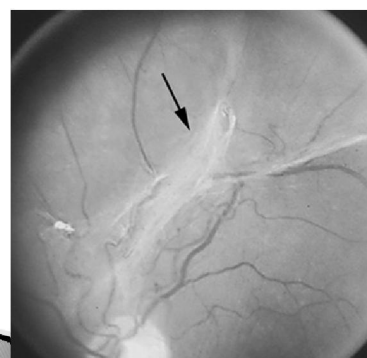
Pre-Retinal Hemorrhage (NVE)



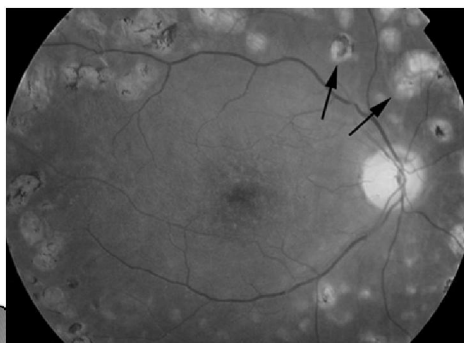
Extensive Vitreous hemorrhage



Traction Retinal Detachment



Panretinal Photo-coagulation



Rubeosis Iridis



Screening for Eye disease

Annually

Visual acuity (corrected with pinhole or lenses)
Careful eye examination (noting the clarity of the lens and any retinal changes
(Ophthalmoscopy through dilated pupils)

Screening for Eye disease

When to refer?

Severe non-proliferative/proliferative retinopathy
Macular edema or exudates in close proximity to the macula
Cataract
Unexplained reduction in visual acuity

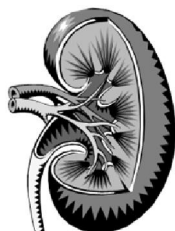
Nephropathy

What is Diabetic Nephropathy

- Microvascular complication
- Albuminuria
- Progressive deteriorating course
- Culminate in Nephrotic syndrome or ESRD

Extent of Diabetic Nephropathy

- ▶ The most common cause of ESRD in the US and Europe
- ▶ No data available for South Africa
- ▶ Prevalence in type 1 diabetes 40%
- ▶ Prevalence in type 2 diabetes 5 – 10%



The Natural History of Diabetic Nephropathy

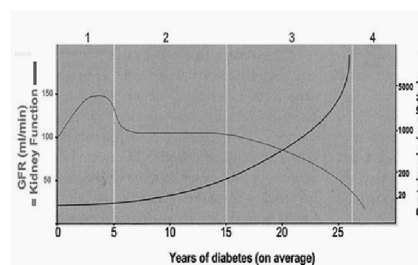
- ▶ Renal hypertrophy and hyperfiltration
- ▶ Incipient Diabetic nephropathy
- ▶ Overt Diabetic nephropathy
- ▶ End stage renal disease



Risk factors

- ▶ Hypertension
- ▶ Hyperglycemia
- ▶ Duration of diabetes
- ▶ Family history
- ▶ Ethnicity
- ▶ Male gender
- ▶ Cigarette smoking
- ▶ ?Hyperlipidaemia

Stages of Diabetic Nephropathy



Stages of DN

Stage I

↑ glomerular filtration and kidney hypertrophy

Stage II

Microalbuminuria (30 – 300 mg/24h)

Stages of DN (cont)

Stage III

Overt nephropathy (> 300mg/24h, positive u dipstick)

Stage IV

ESRD characterized by ↑ blood urea and creatinine levels, hyperkalaemia and fluid overload

Microalbuminuria

- Increased risk for overt nephropathy
- Increased cardiovascular mortality
- Increased risk of Retinopathy
- Increased all-cause mortality

Thus
Microalbuminuria is an indication for screening for possible vascular disease and aggressive intervention to reduce all cardiovascular risk factors

Screening for Nephropathy

Annually

Do one of the following:

- u Albumin:Creatinine ratio (spot sample)
- 24h u Albumin excretion rate
- Early morning Albumin concentration (spot sample)
- Dipstick for Microalbuminuria

If positive the test must be repeated twice in the ensuing 3 months. Microalbuminuria with incipient nephropathy is diagnosed if 2 or more of the tests are within the microalbumin range

How to Treat and Prevent Diabetic Nephropathy

Preventative measures

- Optimal glycaemic control
- Good blood pressure control
- Stop smoking

How to Treat and Prevent Diabetic Nephropathy (cont)

Measures to halt progression of renal disease

- Above measures
- Use of ACE inhibitors
- Restrict dietary protein
- Avoid renal damage from infection and drug use
- Be careful of using radiocontrast agents

Diabetic Neuropathy

Diabetic Neuropathy is Common

- The prevalence of diabetic neuropathy is 10% to 65%
- It affects both type 1 and type 2 diabetic patients
- Most cases are asymptomatic
- Male patients have a slightly higher prevalence
- Can occur at any age

Classification of Diabetic Neuropathy

- Sensorimotor neuropathy
- Autonomic neuropathy
- Mononeuropathy
 - Spontaneous
 - Entrapment
 - External pressure neuropathies
- Proximal motor neuropathy

Sensorimotor Neuropathy

- Patients may be asymptomatic / complain of numbness, paresthesias, allodynia or pain
- Feet are mostly affected, hands are seldom affected
- In Diabetic patients sensory neuropathy usually predominates

Complications of Sensorimotor neuropathy

- Ulceration (painless)
- Neuropathic edema
- Charcot arthropathy
- Callosities



Entrapment Neuropathies

- Carpal tunnel syndrome (median nerve)
 - Ulnar compression syndrome
 - Meralgia paresthetica (lat cut nerve to the thigh)
 - Lat Popliteal nerve compression (drop foot)
- All the above are more common in diabetic patients*

Proximal Motor Neuropathy

Amyotrophy – most common proximal neuropathy, affects the Quadriceps muscles with weakness and atrophy (synonym: Diabetic Femoral radiculo-neuropathy)



Thoracoabdominal Radiculopathy



Mononeuropathy



Peripheral Mononeuropathy



Autonomic Neuropathy

- Occur in up to 30% of diabetic patients
- Frequently under diagnosed mostly because symptoms are frequently mild or sub clinical
- Severe autonomic failure occurs in less than 5% of diabetic patients
- Extent and severity increases with age, duration of peripheral neuropathy, and vascular damage

Cardiovascular Dysautonomia



- Resting tachycardia
- Orthostatic hypotension
- Prolonged QT interval
- Decreased heart rate variability

Gastrointestinal Dysautonomia

- Constipation
- Gastroparesis
- Intermittent diarrhea

Sudomotor Dysautonomia

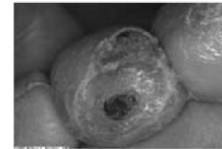


Genitourinary Dysautonomia

- ▲ *Impotence*
- ▲ *Urinary retention with overflow incontinence*

Diabetic neuropathy have bad consequences

- ▶ Peripheral neuropathy predispose diabetic patients for foot problems



Diabetic neuropathy have bad consequences (cont)

- ▶ Dysautonomia may result in:
 - Dysrhythmias due to prolonged QT time
 - Gastric and intestinal dysmotility with maldigestion and malabsorption

Diabetic Neuropathy Prevention

- ▶ Only 1 proven way nl. Tight and stable glucose control
- ▶ Novel therapies are under development to prevent and reverse diabetic neuropathy
 - Aldose reductase inhibitors
 - Pancreatic transplant
 - Nerve growth factors
 - Immunotherapy

Treatment of Neuropathies

- ▶ Painful peripheral neuropathy
 - Tricyclic antidepressants (TCA)
 - Anticonvulsants
 - Antiarrhythmics
 - Capsaicin (topical)
 - Alpha Lipoic acid and Gamma Linolenic Acid

Treatment of Diabetic Neuropathy (cont)

- ▶ Gastroparesis
 - Advice to patients**
 - Avoid hypertonic solutions and fatty meals
 - Avoid adding salt to meals, drink sensible amounts during a meal, cut up food and chew it well
 - Take small frequent meals
 - Prokinetic drugs**

Conclusion

- This is just an outline of the major diabetic complications, and doesn't aim to be comprehensive
- All complications are preventable with good glycaemic control
- The progression of most complications can be halted if detected early and appropriate therapy instituted