Diabetes complications

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Outline

- Microvascular complications
  - Diabetic nephropathy
  - Diabetic retinopathy
  - Diabetic neuropathy
- Macrovascular complications

Diabetic kidney disease (DKD)

- Screening
  - Who to screen:
    - patients with type 1 diabetes with duration of ≥5 years, in all patients with type 2 diabetes, and in all patients with co-HTN
  - At least once a year:
    - urinary albumin (e.g., spot urinary albumin-to-creatinine ratio)
    - eGFR

Diabetic kidney disease (DKD)

- Treatment
  - To reduce the risk or slow the progression of DKD
    - Optimize glucose control
    - Optimize BP control
  - Dietary protein:
    - Non dialysis-dependent DKD: ~ 0.8 g/kg body weight/day
    - Patients on dialysis: higher levels of dietary protein intake should be considered
- Continued monitoring of urinary albumin-to-creatinine ratio in patients with albuminuria treated with an ACEI or an ARB
- An ACEi or an ARB is NOT recommended for the primary prevention of DKD

Diabetic kidney disease (DKD)

- eGFR <60 mL/min/1.73 m2 → evaluate and manage potential complications of CKD
- eGFR <30 mL/min/1.73 m2 → Referral for evaluation for renal replacement treatment
- Promptly refer to a physician experienced in the care of kidney disease for uncertainty about the etiology of kidney disease, difficult management issues, and rapidly progressing kidney disease.

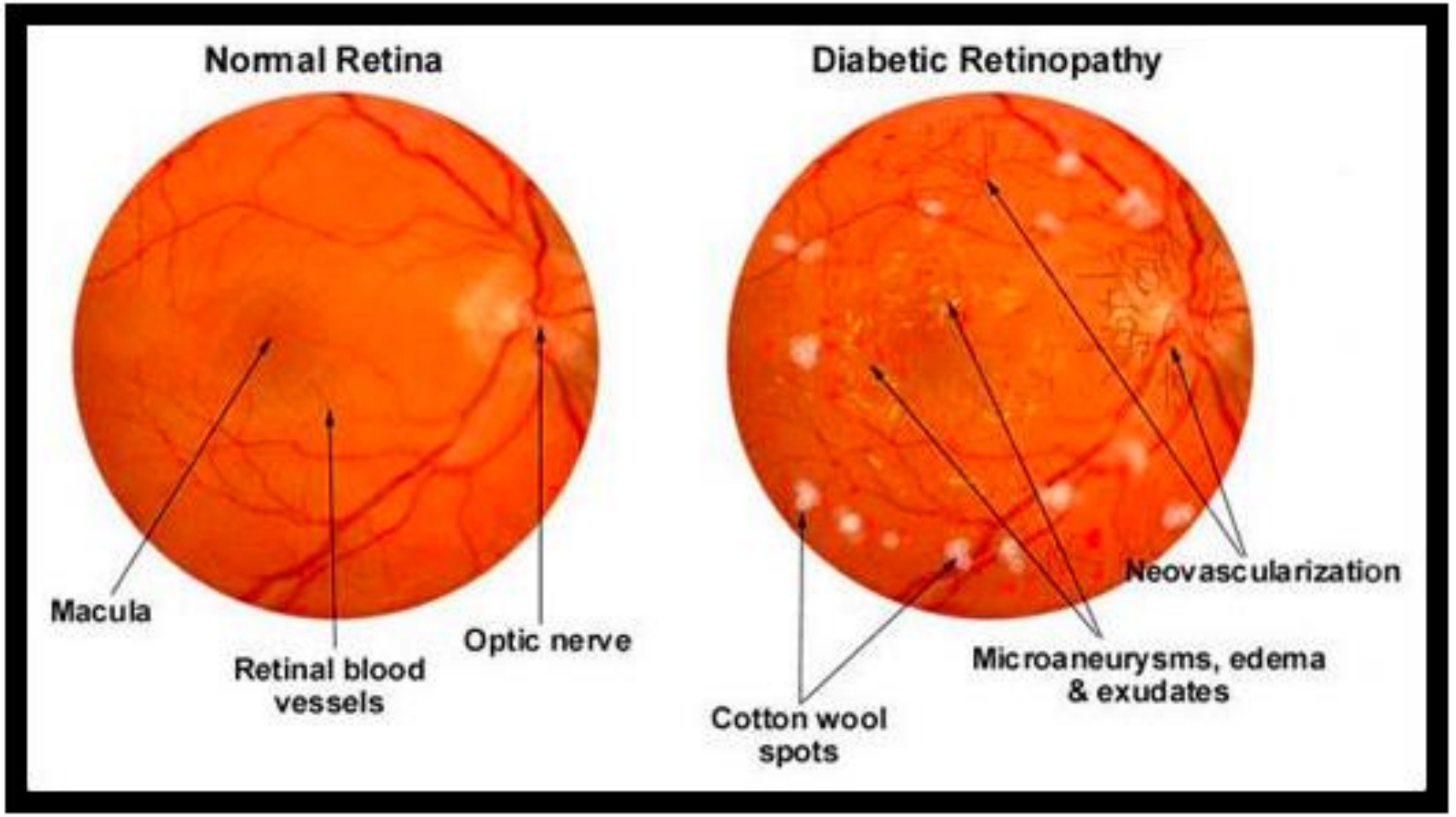
Table 10.1—CKD stages and corresponding focus of kidney-related care

CKD stage†			Focus of kidney-related care			
Stage	eGFR (mL/min/1.73 m^2)	Evidence of kidney damage*	Diagnose cause of kidney injury	Evaluate and treat risk factors for CKD progression**	Evaluate and treat CKD complications***	Prepare for renal replacement therapy
No clinical evidence of CKD	≥60	—				
1	≥90	+	√	√		
2	60–89	+	√	√		
3	30–59	+/−	√	√	√	
4	15–29	+/−		√	√	√
5	<15	+/−			√	√

†CKD stages 1 and 2 are defined by evidence of kidney damage (+), while CKD stages 3–5 are defined by reduced eGFR with or without evidence of kidney damage (+/−). *Kidney damage is most often manifest as albuminuria (UACR ≥30 mg/g Cr) but can also include glomerular hematuria, other abnormalities of the urinary sediment, radiographic abnormalities, and other presentations. **Risk factors for CKD progression include elevated blood pressure, glycemia, and albuminuria. ***See **Table 10.2**.

Diabetic retinopathy

Diabetic retinopathy



Diabetic retinopathy

- To reduce the risk or slow the progression of diabetic retinopathy:
  - Optimize glycemic control
  - Optimize blood pressure control
  - Optimize serum lipid control

Diabetic retinopathy

- Screening
  - initial dilated and comprehensive eye examination by an ophthalmologist/optometrist
    - Adults with type 1 diabetes: within 5 years after the onset of diabetes.
    - Patients with type 2 diabetes: at the time of the diabetes diagnosis.
  - Follow up exams
    - no retinopathy for ≥1 annual eye exam and glycemia controlled → exams every 1-2y
    - any level of diabetic retinopathy → dilated retinal examinations repeated annually
    - progressing or sight threatening retinopathy → more frequent examinations
  - retinal photography = screening tool for retinopathy
  - Women who are planning pregnancy or who are pregnant → counseling on the risk of development and/or progression of diabetic retinopathy.
    - Eye examinations should occur before pregnancy or in the first trimester
    - patients should be monitored every trimester and for 1 year postpartum as indicated by the degree of retinopathy

Treatment retinopathy

- Management of diabetic retinopathy by experienced ophthalmologist if:
  - any level of macular edema
  - severe nonproliferative diabetic retinopathy
  - any proliferative diabetic retinopathy
- Panretinal laser photocoagulation therapy
  - to reduce the risk of vision loss in patients with high-risk proliferative diabetic retinopathy and, in some cases, severe nonproliferative diabetic retinopathy.
- Intravitreous injections of anti-vascular endothelial growth factor (ranibizumab)
  - not inferior to traditional panretinal laser photocoagulation
  - reduce the risk of vision loss in patients with proliferative diabetic retinopathy
  - indicated for central-involved diabetic macular edema
- The presence of retinopathy is not a contraindication to aspirin therapy for cardioprotection (no increased risk of retinal hemorrhage).

Diabetic neuropathy

Neuropathy

- Screening
  - Assessment at diagnosis of T2D and 5 years after the diagnosis of T1D and at least annually thereafter.
  - Assessment for distal symmetric polyneuropathy should include a careful history and assessment
    - Small-fiber function: pinprick and temperature sensation
    - Large-fiber function: vibration perception and 10-g monofilament
    - Protective sensation: 10-gmonofilament (at least yearly)
- Specific syndromes
  - Diabetic Autonomic Neuropathy
  - Cardiac Autonomic Neuropathy
  - Gastrointestinal Neuropathies
  - Genitourinary Disturbances
- Symptoms and signs of autonomic neuropathy should be assessed in patients with microvascular complications.

Treatment for neuropathy

- Optimize glucose control to prevent/delay the development of neuropathy in patients with type 1 diabetes and to slow the progression of neuropathy in patients with type 2 diabetes.
- Assess and treat patients to reduce pain related to diabetic peripheral neuropathy and symptoms of autonomic neuropathy and to improve quality of life.
- Initial pharmacologic treatments for neuropathic pain in diabetes:
  - Pregabalin
  - Duloxetine

Foot care

- Comprehensive foot evaluation at least annually
  - to identify risk factors for ulcers and amputations
  - The examination should include:
    - inspection of the skin
    - assessment of foot deformities
    - neurological assessment (10-g monofilament testing + pinprick or temperature or vibration)
    - vascular assessment including pulses in the legs and feet.
- Feet inspected at every visit
- Important prior history of:
  - ulceration
  - amputation
  - Charcot foot
  - angioplasty or vascular surgery
  - cigarette smoking
  - retinopathy, and renal disease and assess current symptoms of neuropathy (pain, burning, numbness) and vascular disease (leg fatigue, claudication).

Foot care

- Patients with symptoms of claudication or decreased or absent pedal pulses should be referred for ankle-brachial index and for further vascular assessment as appropriate
- A multidisciplinary approach is recommended for individuals with foot ulcers and high-risk feet (e.g., dialysis patients and those with Charcot foot, prior ulcers, or amputation).
- Foot care specialists preventive care and life-long surveillance:
  - Smokers
  - Prior lower-extremity complications
  - loss of protective sensation
  - structural abnormalities
  - peripheral arterial disease
- The use of specialized therapeutic footwear is recommended for high-risk patients with diabetes including those with severe neuropathy, foot deformities, or history of amputation

Table 11.1—Framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes (2)

Patient characteristics/health status	Rationale	Reasonable A1C goal‡	Fasting or preprandial glucose	Bedtime glucose	Blood pressure	Lipids
Healthy (few coexisting chronic illnesses, intact cognitive and functional status)	Longer remaining life expectancy	<7.5% (58 mmol/mol)	90–130 mg/dL (5.0–7.2 mmol/L)	90–150 mg/dL (5.0–8.3 mmol/L)	<140/90 mmHg	Statin unless contraindicated or not tolerated
Complex/intermediate (multiple coexisting chronic illnesses* or 2+ instrumental ADL impairments or mild-to-moderate cognitive impairment)	Intermediate remaining life expectancy, high treatment burden, hypoglycemia vulnerability, fall risk	<8.0% (64 mmol/mol)	90–150 mg/dL (5.0–8.3 mmol/L)	100–180 mg/dL (5.6–10.0 mmol/L)	<140/90 mmHg	Statin unless contraindicated or not tolerated
Very complex/poor health (LTC or end-stage chronic illnesses** or moderate-to-severe cognitive impairment or 2+ ADL dependencies)	Limited remaining life expectancy makes benefit uncertain	<8.5%† (69 mmol/mol)	100–180 mg/dL (5.6–10.0 mmol/L)	110–200 mg/dL (6.1–11.1 mmol/L)	<150/90 mmHg	Consider likelihood of benefit with statin (secondary prevention more so than primary)

This represents a consensus framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes. The patient characteristic categories are general concepts. Not every patient will clearly fall into a particular category. Consideration of patient and caregiver preferences is an important aspect of treatment individualization. Additionally, a patient's health status and preferences may change over time. ADL, activities of daily living. ‡A lower A1C goal may be set for an individual if achievable without recurrent or severe hypoglycemia or undue treatment burden. *Coexisting chronic illnesses are conditions serious enough to require medications or lifestyle management and may include arthritis, cancer, congestive heart failure, depression, emphysema, falls, hypertension, incontinence, stage 3 or worse chronic kidney disease, myocardial infarction, and stroke. By "multiple," we mean at least three, but many patients may have five or more (47). **The presence of a single end-stage chronic illness, such as stage 3–4 congestive heart failure or oxygen-dependent lung disease, chronic kidney disease requiring dialysis, or uncontrolled metastatic cancer, may cause significant symptoms or impairment of functional status and significantly reduce life expectancy. †A1C of 8.5% (69 mmol/mol) equates to an estimated average glucose of ~200 mg/dL (11.1 mmol/L). Looser A1C targets above 8.5% (69 mmol/mol) are not recommended as they may expose patients to more frequent higher glucose values and the acute risks from glycosuria, dehydration, hyperglycemic hyperosmolar syndrome, and poor wound healing.

Macrovascular complications

- Coronary artery disease
- Peripheral artery disease
- Cerebral vascular accident

Coronary Heart Disease

- Screening
  - In asymptomatic patients
    - routine screening is not recommended
    - It does not improve outcomes as long as atherosclerotic CVD risk factors are treated.
  - Investigate for coronary artery disease
    - atypical cardiac symptoms (e.g., unexplained dyspnea, chest discomfort)
    - signs or symptoms of associated vascular disease
      - Carotid bruits
      - Transient ischemic attack
      - Stroke
      - Claudication
      - Peripheral arterial disease
    - or electrocardiogram abnormalities (e.g., Q waves).

Treatment

- In patients with known atherosclerotic CVD, consider ACEi or ARB therapy to reduce the risk of cardiovascular events.
- If prior MI, **b**-blockers should be continued for at least 2 y after the event
- In patients with T2D with stable CHF, metformin may be used if eGFR remains >30 mL/min but avoided in unstable or hospitalized patients with congestive heart failure.
- In patients with T2D and established atherosclerotic CVD, antihyperglycemic therapy should begin with lifestyle management and metformin and subsequently incorporate an agent proven to reduce major adverse cardiovascular events and cardiovascular mortality (currently empagliflozin and liraglutide).
- The antihyperglycemic agent canagliflozin may be considered to reduce major adverse cardiovascular events, based on drug-specific and patient factors

Questions?

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