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"The majority of diabetic patients with hypertension are not controlled to guideline targets... The 2000 Canadian Recommendations for the Management of Hypertension guidelines recommend individualized treatment for patients with concomitant diseases such as diabetes." Dr. S. Tobe

Developed by

Sheldon Tobe, MD, FRCPC, Sunnybrook & Women's College Health Science Centre, Toronto, Ontario, and
Peter Lin, MD, CCFP, Family Medicine, Toronto, Ontario

– Case Study: Hypertension –

Patient Profile

LK is a 55-year-old female office manager who presents for a regular follow-up visit. She has type II diabetes, which was diagnosed 12 years ago and is currently managed with a combination of glyburide and metformin.

A year ago, LK's blood pressure was measured at 135/90, and you discussed weight loss and exercise with her. However, she was not successful in reducing her weight or blood pressure through lifestyle changes.

Two months ago, LK's blood pressure was 146/94. At that time, you ordered urine albumin measurement to determine whether LK was at risk of developing nephropathy. The result was 100 mg/L – well within the microalbuminuria range.

You prescribed lisinopril 10 mg daily. A month later, LK's blood pressure was unchanged and you increased her dose to 20 mg daily. Repeat urine albumin measurement shows a drop to 60 mg/L, which remains elevated.

Physical examination:
- 166 cm, 72 kg (BMI 26.1)
- BP 140/94 mm Hg
- HbA_{1C} 7.4%; FBG 5.8 mmol/L
- TC 4.9 mmol/L; HDL-C 1.1 mmol/L; LDL-C 3.3 mmol/L; TG 2.0 mmol/L

Questions

1. **According to the 2000 Canadian Recommendations for the Management of Hypertension, under which circumstances are antihypertensive agents indicated in diabetes?**

2. **How do blood pressure treatment targets differ in diabetic patients?**

3. **What should this patient's target blood pressure be, and which agents should be prescribed next?**

Answers

1. **According to the 2000 Canadian Recommendations for the Management of Hypertension, under which circumstances are antihypertensive agents indicated in diabetes?**
   - Antihypertensive agents should be considered where there is a sustained SBP > 140 mm Hg or DBP ≥ 90 mm Hg, if no other risk factors are present.
   - In the setting of additional risk factors, such as microalbuminuria or cardiovascular disease, treatment is indicated for SBP > 130 mm Hg or DBP > 80 mm Hg.
   - In both cases the treatment goals are to reduce the blood pressure below SBP 130 mm Hg and DBP 80 mm Hg.

2. **How do blood pressure treatment targets differ in diabetic patients?**
   - While targets for the general population are commonly < 140/90 mm Hg, diabetic patients should aim for blood pressure levels < 130/80 mm Hg.

3. **What should this patient's target blood pressure be, and which agents should be prescribed next?**
   - Due to her diabetes, LK's target blood pressure should be below 130/80 mm Hg.

- Achieving these levels frequently requires the use of more than one agent: a review of clinical trials found that > 65% of patients with diabetes and hypertension required ≥ 2 different antihypertensive medications to reach 130/80 mm Hg.[1]
- The 2000 Canadian guidelines recommend individualized treatment for patients with concomitant diseases such as diabetes. For a patient such as LK, with type 2 diabetes and microalbuminuria, first-line therapy is an ACE inhibitor, or an angiotensin receptor blocker if an ACE inhibitor is not tolerated. If this is ineffective, as was the case here, the guidelines suggest adding a long-acting calcium channel blocker, a low-dose thiazide diuretic or a cardioselective beta-blocker.

Response to Therapy

- Because LK's hypertension was not controlled on an ACE inhibitor alone, a calcium channel blocker was added: amlodipine, 5 mg/day.

- Two weeks later, LK's blood pressure was measured at 136/86 and she had not experienced any adverse events. A urine albumin test showed less than 20 mg/L, which is within the normal range.

- Low dose hydrochlorothiazide is added (12.5 mg/day).
- Two weeks later, LK's blood pressure is measured at 128/80 and she continues to feel well.

Key Learning Points

- The majority of diabetic patients with hypertension are not controlled to guideline targets: one study of diabetic patients coming to treatment centres found that 29% were unaware of their hypertension, 7% were aware but untreated, 39% were treated but not controlled to below 130/80, and only 25% were treated to achieve ≤ 130/80 mm Hg.[2]

- Microalbuminuria (30 to 300 mg/day of albumin in the urine) reflects renal damage, and increasing levels of urine albumin represents increasing progression of diabetic nephropathy. In diabetic patients, therefore, urine albumin is an excellent (and cost-effective) marker for the identification of those patients at particularly high risk of kidney disease.

- Patients with proteinuria ≥ 1 g/day are at high risk of end-stage renal disease and should be managed aggressively, including referral to a nephrologist if possible.

Practice Tip

Another marker for renal damage is creatinine clearance, which is an estimate of glomerular filtration rate. Normal values are between 97 and 137 mL/min for males, and between 88 and 128 mL/min for females, depending on the patient's age and size.

To calculate creatinine clearance, use the Cockroft-Gault equation:

Predicted creatinine clearance (mL/min) =

$$\frac{(140 - \text{age in years}) \times (\text{body weight in kg}) \times (\text{constant})}{(\text{serum creatinine in } \mu mol/L)}$$

where the constant is 1.0 for females and 1.2 for males

References:
1 Bakris GL, Williams M, Dworkin L, Elliott WJ, Epstein M, Toto R, et al. Preserving renal function in adults with hypertension and diabetes: a consensus approach. National Kidney Foundation Hypertension and Diabetes Executive Committees Working Group. *Am J Kidney Dis*. 2000;36(3):646-61.

2 Tobe SW, Khan SU, Basiuk JP, Tsigoulis M, Naimark DMJ, Bott M. The Detection Study: Awareness Treatment and Control of Hypertension in Diabetic Patients attending an Education Centre. Journal of the American Society of Nephrology. 1-10-2001. Ref Type: Abstract..

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