Human Insulin and Insulin Analogues in the Treatment of Diabetes: 4 Cases

Presenter, Title, Affiliation

Date

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Learning objectives

Upon completion of this workshop the participant will:

- Understand the evidence base supporting the use of human insulin and insulin analogues in the treatment of diabetes.
- Identify the appropriate use of insulin preparations in:
  - The general population with diabetes
  - Special cases where insulin analogues should be considered

Outline

Case Study 1: Insulin initiation with patient on oral antidiabetes agents (OADs)

Case Study 2: Insulin initiation with patient not taking oral antidiabetes agents (OADs)

Case Study 3: Hypoglycemia in an insulin user

Case Study 4: Complex insulin regimens

Case #1: Insulin initiation with patient on oral antidiabetes agents

- Mr. C is a 60-year old patient with diabetes who works at a bank.
- He works the evening shift and comes home exhausted without time for exercise.
- He is “not into sports”.
- He has had type 2 diabetes for six years.
- He has a history of hypertension, hypercholesterolemia, and obesity.
- He has impaired kidney function.
- He has attended the local hospital diabetes education centre.

Case #1 (cont'd)

Current medications:

- Metformin 1000 mg twice a day
- Glyburide 10 mg twice a day
- Simvastatin 20 mg daily
- ASA 81 mg daily
- Ramipril 10 mg daily

Physical exam:

- Weight = 90 kg
- A1C = 8.3%
- BMI = 29 kg/m^2
- eGFR = 50 mL/min

Case #1: Discussion

Question 1

- When do you have to consider adding insulin? At what level of A1C is it crucial to consider?

Case #1: Discussion (cont'd)

Question 2

- What is the easiest protocol for the family physician to recommend to the patient for convenience and ease of administration?

Case #1: Discussion (cont'd)

Question 3

- What insulin would you choose?

Case #2: Insulin initiation with patient not taking oral antidiabetes agents

- Mr. L is a 42-year old man who recently immigrated to Canada.
- He presents to your clinic with fatigue, a 5-kg (11-lb) weight loss over four weeks, increased thirst, blurry vision, and increased urination.
- He has no abdominal pain, nausea, or vomiting.
- He works on a farm and speaks very little English but comes in with his nephew who helps to translate.
- He has no extended health plan and is asking for an injection as he believes this will provide him with the “best chance for a cure”.

Case #2 (cont'd)

Current medications:

- None

Physical exam:

- Weight = 60 kg
- BMI = 22 kg/m^2
- BP = 130/60 mmHg (lying)
- BP = 130/80 mmHg (standing)
- FBG = 18.6 mmol/L
- A1C = 14.8%
- Remaining lab tests = normal

Case #2: Discussion

Question 1

- Are there situations when you should consider initiating combination therapy (insulin and oral antidiabetes agents) right away?

Case #2: Discussion (cont'd)

Question 2

- What are the immediate and long-term goals of therapy?

Case #2: Discussion (cont'd)

Question 3

- What regimens could be used?

Case #3: Hypoglycemia in an insulin user

- Mrs. R is a 50-year old golf instructor with type 1 diabetes.
- For decades, she has used the following regimen:
  - Regular insulin: 10 units at breakfast and 15 units at suppertime
  - Insulin NPH: 20 units at breakfast and 20 units at suppertime
- She has become alarmed by recurrent overnight hypoglycemia which tends to occur around 0300 hours.
- She has required emergency treatment on two occasions when her husband could not wake her.

Case #3 (cont'd)

- She says that she can no longer tell when her blood sugars are low; she has no symptoms.
- She has diet controlled hypercholesterolemia, and she is on Hydrochlorothiazide for well controlled hypertension.

Current medications:

- Hydrochlorothiazide 25 mg daily

Physical exam:

- A1C = 7.9%

Case #3: Discussion

Question 1

- Why is this woman developing serious hypoglycemia?

Case #3: Discussion (cont'd)

Question 2

- What steps can be taken to protect her and to prevent recurrence?

Case #3: Discussion (cont'd)

Question 3

- Is there a role for long-acting insulin analogues?

Case #4: Complex insulin regimens

- Mr. B is a 34-year-old male who was diagnosed with type 1 diabetes at age 19.
- He is a busy computer systems analyst. Work is hectic with frequent travel to different time zones.
- He enjoys physical activity and “fits it in” whenever his schedule permits.
- He is married and recently had his first child.
- He is very concerned about “labile” blood sugars with many highs and lows. He is quite motivated to improve his long-term health.

Case #4 (cont'd)

- He has been using human insulin twice daily for many years with no change in doses:
  - Regular insulin: 6 units at breakfast and 10 units at suppertime
  - Insulin NPH: 12 units at breakfast and 10 units at suppertime
- He has an extended medical plan.
- He is very proud of the computer program he developed to monitor his blood pressure and glucometer reading, which he brings in each week in a graphical format.
- He is very keen on controlling his sugars to prevent an amputation and blindness, which his older brother had secondarily due to poorly controlled sugars.

Case #4 (cont'd)

- According to the graph that he presents to you, his sugars are variable but generally show high morning sugars averaging 9.8 mmol/L.

- His blood glucose is frequently too low four hours after eating, despite having high blood glucose levels two hours after meals.

Case #4 (cont'd)

Current medications:

- Acetaminophen as needed
- Multivitamin
- Salmon oil 3 gms daily

Physical exam:

- No abnormalities; average weight
- A1C = 8.4%
- Lipids, blood pressure, renal tests = on target

Case #4: Discussion

Question 1

- When would an “intensive” insulin regimen be appropriate?

Case #4: Discussion (cont'd)

Question 2

- Which insulin could be used? How do you adjust and titrate?

Case #4: Discussion (cont'd)

Question 2

- Which factors could be considered in choosing the types of insulin?

Insulin therapy: Dos and don’ts

Summary

- Lots of discussion about rapid- and long-acting insulin analogues and benefits (e.g, consider flexibility of schedule/ meals).
- In general, modest clinical benefits in most patients and increased cost with insulin analogues.

Dos and don’ts (cont’d)

Basal insulin therapy

- In patients with type 1 or type 2 diabetes requiring basal insulin, insulin NPH should be considered first.
  - Although the evidence is limited and inconsistent, patients who are experiencing significant hypoglycemia while taking insulin NPH may benefit from long-acting insulin analogues.

Dos and don’ts (cont’d)

Bolus insulin therapy

- Either rapid-acting insulin analogues or regular human insulin can be considered first-line therapy for patients with type 1 diabetes (except in adolescents).
- Regular human insulin may be considered as first-line therapy for patients with type 2 diabetes.

Dos and don’ts (cont’d)

- Explore potential fears
- Do not “threaten” with insulin
- Insulin start packets – ready-to-go
- Consider delivery options (e.g., pens, devices)
- Team up (i.e., certified diabetes educator, interim education and support)

Dos and don’ts (cont’d)

- Consider lifestyle and budget
- Follow-up within one week: adjustment and more education
- Patient education and joint decision making: Dose change
- Praise and positive reinforcement

Wrap-up

- Questions
- References
- Other resources

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