Diabetes in Athletes

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Goals & Objectives
- Understand the patterns of glucose utilization during exercise and sporting events
- Identify potential factors for complications in diabetic athletes
- Prevent, recognize, and treat hypoglycemia and hyperglycemia in diabetic athletes
- Prevent Delayed Onset Hypoglycemia

Diabetes Mellitus
- Most common metabolic disease in U.S. and South TX
- Characterized by hyperglycemia
- Can be caused by:
  - Problem with insulin secretion (DM Type 1)
  - Problem with insulin activity (DM Type 2)
Exercise and Diabetics

- Physical exercise is strongly recommended
- Multiple physiologic and psychologic benefits
- Major risk of exercise is hypoglycemia
  - Rarely hyperglycemia
- Athletes’ participate for competitiveness, achievement, financial reward
  - Usually more important than glucose control for some athletes

DM Type 1

- Most often diagnosed before age 30
  - Most often diagnosed in teenage years
- Loss of insulin secretion in the bloodstream
- Results in hyperglycemia, weight loss, ketoacidosis
  - Hypoglycemia can result from excess insulin

DM Type 2

- Most often diagnosed in adults 30-40 years and older
  - Increasing incidence in youth
- Loss of insulin activity at the muscles
  - Can ultimately cause loss of insulin secretion
- Hyperglycemia, weight loss, ketoacidosis
  - Hypoglycemia from excess insulin

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Hypoglycemia
• State of LOW serum glucose (< 70 mg/dL)
• Hunger, anxiety, sweating, tachycardia, tremor, palpitations, feeling of doom
• Neuroglycopenic symptoms include weakness, slow speech, poor vision, vertigo, odd behavior, confusion, paresthesias, stupor, seizures, LOC; from lack of cerebral glucose

Hyperglycemia
• Typically:
  • Under-dosing of meds
  • Excess carb intake prior to, during, or after activity
• Symptoms include excess thirst, fatigue, blurry vision, headache, nausea/vomiting, dry mouth, confusion
• Rarely an issue in athletics

Let’s Get Moving
Normal Response to Exercise

- Anaerobic exercise (short burst, near-max intensity):
  - Stimulates lactate utilization (and aerobic processes if prolonged) and not significant glucose use
- Aerobic exercise elicits glycogenolysis, lipolysis, & aerobic gluconeogenesis
  - INCREASE SERUM GLUCOSE
  - Increase of insulin, IGF, etc
  - DRIVE GLUCOSE INTO MUSCLES FOR USE
- Feedback mechanisms stabilize blood glucose

Diabetic Response to Exercise

- Aerobic exercise stimulates glucose production
- Impaired gluconeogenesis
  - Less glucose being made available
- Exogenous insulin combines with peripheral muscle use of serum glucose
  - Decrease in serum glucose
- Impaired feedback mechanisms to stimulate gluconeogenesis
  - HYPOglycemia

Hypoglycemia During Exercise

- Take 15 g of fast-acting carb every 15 - 30 minutes
  - 15 g of fast-acting carb = 1 Tbsp syrup, sugar, honey or 6-7 small hard/soft candies
- Re-check blood glucose every 15 - 30 minutes
  - Can also use complex carbohydrates (oats, grains, etc) if continued activity and likely recurring hypoglycemia

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Delayed Hypoglycemia

- Exercise causes increased peripheral muscle uptake of serum glucose
- Effect can last up to 48 hours
- Inadequate replacement of serum glucose stores during/post-exercise
  - Delayed hypoglycemic effect
  - Presents with seizures, cardiac, arrhythmias, unconsciousness, death
- Provide 1.5 g/kg (avg. 100 g of carb/70 kg person) within 30 minutes of completion; repeat 1-2 hours later
  - Monitor blood sugar closely during the night

Hypoglycemia Prevention

- Best treatment is prevention
- Decreased insulin/medication use prior to competition
  - If exercise is < 1 hour, 30% reduction
  - If 1 – 2 hours, 40% reduction
  - If > 2 hours, 50% reduction

Hyper-glycemia

- If patient already hyperglycemic, anaerobic exercise (short-burst, high-intensity) can worsen serum glucose
Hyperglycemia
• If pre-exercise glucose is > 250 mg/dL and urine ketones are present, DO NOT allow to play
  • Can worsen the HYPERglycemia
  • Best treatment is glucose-free hydration
• If pre-exercise glucose is > 250 mg/dL and NO urine ketones
  • Ok to play but monitor blood sugars closely

Tips
• Identify diabetic patients so that ALL staff are aware
• Avoid injection of insulin into area of exercising muscle (increases insulin usage)
• Plan meals accordingly before and after activity
• Set pre-determined time periods for glucose checks and sugar snacks
• Keep easily-digestable carbohydrate snacks/packs etc

Having a Plan
• Coordinate travel supplies and ensure adequate medications available
• Discuss athlete's attitudes, medication regimen, and limits regarding diabetic control
• Have a coordinated plan for hypoglycemia and hyperglycemia and discuss it with diabetic athletes before activities/competitions

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Thank You