WELCOME

to

Steroids and Diabetes

Donna M. Wahoff-Stice, MS, APRN, FNP-BC

Reminders:

• Pre-Test, presentation, evaluation, and post-test available at www.health.utah.gov/diabetes/

• Please mute during the presentation
Steroids and Diabetes

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University of Utah
What is a Steroid?

• Steroids are organic compounds
• Sex hormones: androgens, estrogens and progesterones
• Anabolic steroids
• Corticosteroids:
  – Mineralocorticoids – blood volume and electrolytes
  – Glucocorticoids - metabolism & immune function
Drugs that Can Cause Diabetes Or Increase Glucose in Persons with Pre Existing Diabetes

• Glucocorticoids:
  – Examples: prednisone, dexamethazone

• Immunosuppressive drugs for Transplant:
  – Examples: Tacrolimus (Prograf), Sirolimus (Rapamune), cyclosporin
## Corticosteroid Agents

<table>
<thead>
<tr>
<th>Agent</th>
<th>Duration of Action</th>
<th>Tmax (hours)</th>
<th>Equivalent dose, mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortisol</td>
<td>S</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Cortisone</td>
<td>S</td>
<td>?</td>
<td>25</td>
</tr>
<tr>
<td>Prednisone</td>
<td>I</td>
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<tr>
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<td>I</td>
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<td>4</td>
</tr>
<tr>
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<td>L</td>
<td>?</td>
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</tr>
<tr>
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s = Short acting: 8-12 hrs. half life; I=Intermediate acting: 12-36 hrs. half life; L=Long acting: 36-72 hrs. life

Equivalent dosing schedule applies only to oral or IV administration

Table compiled by Nicholas Miles, PharmD
Short Term Uses of Steroids

• Burst and Taper or short course
  – Allergy
  – Joint Injections
  – Asthma Exacerbation
  – Herniated Disc
  – Chemo pretreatment
Long Term Uses of Steroids and Immunosuppressant Drugs

- COPD
- Pulmonary Interstitial Fibrosis
- Renal, Heart, Liver Transplantation
- Rheumatoid Arthritis
- Myasthenia Gravis
- Lupus
Hyperglycemia Management
Decision Making

- Short term drug use?
- Long term drug use?
- Is this new hyperglycemia/diabetes?
- Do they have preexisting diabetes?
  - What is their current control?
  - What is their current therapy?
    - Orals- non sulfonylurea vs. sulfonylurea
    - Insulin- premix vs. basal/bolus insulin
Case Study #1

• Husband calls clinic regarding his 74 y.o. wife’s high blood sugars, suddenly over 200.
• Does she have pre existing diabetes?
  – DM 2 x 5 years
• Current treatment and Control?
  – Currently on metformin 500 mg bid (does not tolerate more due to diarrhea)
  – Januvia 50 mg
  – Most recent A1c was 6.5%
Case Study #1

- No, “she is not sick”
- No UTI symptoms
- “Hasn’t felt better in years”
- “She can walk again”
Do intra-articular steroid injections affect glycemic control?

- 9 patients with DM and arthritis of the knee
- Injected with 50 mg methylprednisolone acetate
- Peak BG elevation (300 mg/dl) 5-84 hours post injection
- Lasting 2-3 days
- 7 of 9 patients

Habib BS, Bashir M, Jabbour Ann Rheum Dis. 2008:67;1790-1791
Do intra-articular steroid injections affect glycemic control?

- 6 patients DM and arthritis of the knee
- Injection with Betamethasone acetate 3 mg and betamethasone acetate 3mg
- Injection produced hyperglycemia in all 6
- Ranging from 251-430 mg/dl
- Time to peak <6 hours

Habib BS, Safia A. Clinical Rheumatology. 2009:28;85-87
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Table compiled by Nicholas Miles, PharmD
Case Study #1

• Treatment Options
  – Temporarily increase oral meds
    • Why? or Why Not?
Case Study #1

• What to Do?
• Offer reassurance
  – Overall control is good with A1c of 6.5%
  – Glucose effect likely to last about one week
  – Oral agents
    • Not able to tolerate more metformin
    • Januvia
Case Study #2

- Mr. G. is a 58 y.o. male calls clinic concerned that his glucoses are running in the 225-300 range
- He “threw his back out” and was seen in the Intsta Care
- He was started on a new medication that he will only take for about a week
Case Study #2

• Does he have pre existing diabetes?
  – DM type 2 x 7 years

• Current Control and Medications?
  – Last A1c 7.0%
  – Current medications:
    • Metformin 1000 mg bid
    • Januvia 100 mg qd
    • Glimiperide 2 mg Q AM
Case Study #2

- Control was OK
- Prednisone is intermediate acting
- Effects will resolve within days of stopping prednisone
- Could do nothing
- Can increase glimiperide
Case Study #3

• MS. P is a 42 year old female with Type 2 diabetes and Myasthenia Gravis
• She has been on a long term prednisone dose of 5 mg.
• She has had a recent exacerbation of symptoms and her prednisone dosage has been increased to 20 mg. BID
• She calls because her "BG is Hi, Hi, Hi"
Case Study #3

• What is her current control?
  – Current A1c 7.3%

• What is her current therapy?
  – Metformin 1000 mg BID
  – Glimiperide 4 mg QD
  – Lantus 35 units HS
Case Study #3

• How long is she likely to be on increased dose?
• What are her glucoses running?
• Is she high fasting, ac, pc, or all of the above?
  – FBS are >200
  – AC/PC glucoses 250-300 and higher
Case Study #3

• What steps to take?
• Step 1- Increase Lantus by 5-8 units
• Step 2- Start meal time (bolus) insulin + correction dose for highs
Case Study #3

- **Lantus Titration Schedule**

<table>
<thead>
<tr>
<th>3 day Fasting Average</th>
<th>Change in Lantus</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 180 mg/dl</td>
<td>+ 8 units</td>
</tr>
<tr>
<td>140-179 mg/dl</td>
<td>+ 6 units</td>
</tr>
<tr>
<td>120-130 mg/dl</td>
<td>+ 4 units</td>
</tr>
<tr>
<td>110-119 mg/dl</td>
<td>+2 units</td>
</tr>
<tr>
<td>100-110 mg/dl</td>
<td>Same Dose</td>
</tr>
</tbody>
</table>

If Fasting below 70 can decrease dosage
Case Study #3

• Bolus Insulin
  – Start with set dose at meals 5-8 units
  – Increase dosage based upon ac glucose and amount of correction needed
  – Add Correction dose to meal bolus using rule of 1800
Case Study #3

- Rule of 1800
- Basal Insulin = 40 units
- Bolus Insulin = 15 units
- $1800 \div 55 \text{ units} = 32.7$
- 1 unit of insulin is expected to lower glucose 32.7 points (a very impractical number!)
Case Study #3
Correction Dosing

• Pick a glucose goal
  – Usually 100-120 pre prandial glucose
  – To determine correction insulin dose, subtract goal glucose from current glucose and divide by correction factor
  – Current glucose is 225
  – Goal or target glucose is 100
  – 225-100=125
  – 125 divided by 35 = 3.5 units (would probably round up in this case)
  – This correction dose is added to meal dose. Dose taken before meal would be 9 units
Case #3

• This patient needs to be referred to diabetes education
• It is often easier for patients to have a “scale” of correction doses to add to their meal insulin
  • @135 +1
  • 136-170 +2
  • 171-203+3
  • etc
Case #4

• Nurse Practitioner from Cancer Hospital calls regarding 70 y. o. female under going chemotherapy

• Out patient infusion regimen includes pretreatment with IV dexamethasone and 3 days oral prednisone post infusion
Case # 4

• Pre existing diabetes?  Drug induced diabetes?
• Fasting glucose on pretreatment labs
  130 mg/dl.  Random >250 post tx.
• Diagnostic criteria:
  – FBS>126 (should be repeated)
  – Hemoglobin A1c > 6.5%
Case Study #4

- A1c 7%
- No current diabetes treatment
- Which treatment?
  - Orals
  - Premix
  - Basal/bolus
  - Correction dosing only
Case Study #4
More Questions

• Appetite?
  – Poor
• What glucose goal is realistic?
• Orals – why not?
• Pre mix – why not?
• Basal/bolus - why not?
• Correction only – why and how much
• She needs a meter!
Case Study #5

- 33 y. o. female referred by renal 6 months post renal transplant for ESRD r/t polycystic kidney disease
- Current immunosuppressant medications
  - Prednisone 7.5 mg BID
  - Tacrolimus 0.1 mg /kg Q12 hours
  - Multiple meds for HTN, Lipids
Case Study #5

- Does she have diabetes?
- A1c done per renal = 7.2%
- Oral medication options
  - Metformin?
    - Creatinine 1.1 mg/dl
  - Sulfonylurea?
  - Byetta?
  - Januvia?
Case Study #6

• 68 y.o. female with exacerbation of longstanding Asthma
• Does she have pre existing diabetes?
  – Current A1c 7.5
• Anticipated duration of therapy?
  – Increased steroid inhaler + oral prednisone 6-8 weeks
• Current treatment?
  – 75/25 insulin 60 units ac breakfast and 20 units ac dinner
• Refuses to change to basal/bolus regimen
<table>
<thead>
<tr>
<th>Pre Mix Insulin</th>
<th>Starting dose</th>
<th>Breakfast 2/3 of TDD</th>
<th>Dinner 1/3 of TDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once weekly if most values in</td>
<td>Adjust dose by:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>range below</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;80 mg/dl</td>
<td>-2 units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80-109 mg/dl</td>
<td>No change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110-139 mg/dl</td>
<td>+2 units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140-179 mg/dl</td>
<td>+4 units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180 or &gt;</td>
<td>+6 units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre dinner value is used to adjust</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pre breakfast dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre breakfast value is used to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>adjust pre dinner dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not increase dose if episode of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hypoglycemia (&lt;70) occurs during</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 day period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapted from Lilly</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Type 1 Diabetes

• Should already be on basal/bolus insulin with correction dosing.
• If short term treatment – use correction
• If long term treatment – adjust basal and bolus doses + use correction
Please fill out the evaluation and post-test at
www.health.utah.gov/diabetes/

THANK YOU

See you next month

3rd Wednesday of Each Month
Noon - 1pm Mountain Daylight Time
11 - 12pm PDT & MST / 1 - 2pm CDT / 2 - 3pm EDT