Neonatal Diabetes

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Objectives

• Identify and define neonatal diabetes
• Describe the difference between transient and permanent
• Review the complexity of transition to pump and use of diluted insulin
• Explain the barriers of transitioning patient from hospital to home
• Discuss how to apply new knowledge to future care of new neonatal diabetic patient and family centered care

Conflicts of Interest Disclosure

No conflicts of interest related to the content of this presentation
Neonatal Diabetes

- Hyperglycemia requiring insulin treatment that presents within the first 6 weeks to 3 months of life
- A rare condition
  - 1 in 215,000-500,000
- May be caused by several different genetic mutations
- Two categories

What’s the difference?
Transient Neonatal Diabetes (TND)

- More than half of the population of neonatal diabetes
- 70% of the TND caused by 6q24
- Resolves by 18 months of age
- Possible development of diabetes in later life
- Need for subcutaneous insulin

Transient Neonatal Diabetes (TND)

6q24 imprinted genes can occur in three ways

1. 40%: Paternal Uniparental Disomy (UPD) of Chromosome 6 (paternal x2 copies)
2. 40%: Duplication of genetic material on the copy given by father (paternal duplication on 1)
3. 20%: impaired silencing of maternal copy of the genes (maternal hypomethylation)
Permanent Neonatal Diabetes

- No resolution
- Clinical manifestations at time of diagnosis
  - IUGR, hyperglycemia, severe dehydration, FTT
- 5 genes involved: KCNJ11, ABCC8, INS, GCK, PDX1
- KCNJ11 & ABCC8 respond to oral sulfonylureas, other require insulin
- Pancreatic enzyme replacement therapy

Diagnostics

Neonatal Testing
Neonatal Diabetes Mutation Analysis CPT 81479
($3000.00)
5841 S. Maryland Ave Rm G701 MC 0077
Chicago, Illinois 60637
University of Chicago Genetic Services Laboratory
(uccgtlabs@genetics.uchicago.edu)
1-888-824-3637
3-10 ml EDTA/purple tube

MM Case Study

Newborn - 3/18/15
C/S for breech presentation at 39 wks
Birth weight: 5 lb 14 oz
estimated birth wt: 7 lb, no growth after 34 weeks
Day 3 of life: POC Glucose ranges 14-78 mg/dl
Hypothermia
Septic workup and Antibiotics
D 10 infusion for 48 hours
MM Case Study

3/24/15 - discharge Day 6 of life
• prior to discharge POC glucose: 54, 53, 53
3/25/15 - presented to ED with poor PO and difficult to arouse
• POC glucose: 455
• Sunken fontanel
• Ph: 7.34
• Ammonia: 83

MM Case Study

• Episodes of apnea in ED
• Subsequent POC glucose 531/555
• Respiratory Failure
  – Intubation
  – Admission
  – Septic work up
  – Antibiotics
  – 0.5 units of insulin subcutaneous x1

Let the Work Begin!!!!

• Transitioned to insulin drip: 0.01 unit/kg/hour (total of 0.6 Units of basal insulin per day)
• Bolus insulin based on sliding scale every 3 hours with feeds via IV
• Blood sugar less than 100: 0 units
  – 101-200: 0.015 units
  – 201-300: 0.025 units
  – 301-400: 0.035 units
  – More than 400: 0.045 units
Next Steps

Responded well to insulin, not going to start Sulfonylureas

How do we transition off of the insulin drip?

What small doses do you need, sweet baby!!

Insulin Pump Therapy

- Need an insulin pump with small basal and bolus increments
- Need to be able to dose across the room if baby sleeping

What pump would you pick?
Omnipod/ANIMAS/Tandem/Medtronic

What about a glucose meter?

Lets teach

- Inpatient nursing policy: Patient’s Pump
- Parent education
- PICU Plan of Care:
  - Discharge date goal
  - Staffing plan (consistency)
  - In-service on insulin pump (RNs need to have basic knowledge)
  - Diabetes Treatment Center involvement
Let’s do this

Insulin pump orders: Animas PING insulin pump: Humalog insulin dilution 1:10 which means it is 10 units of insulin per 1 ml.

Basal insulin: actual insulin dose will be 0.005 units per hour (for total amount of 0.12 units over 24 hours), this will equate to 0.05 on the insulin pump.

Insulin on Board: 3 hours.

Bolus insulin through Animas insulin pump every 3 hours for feed: 20% immediately and remaining 80% over 30 minutes.

<table>
<thead>
<tr>
<th>Blood sugar</th>
<th>Actual dose of insulin</th>
<th>Dilute insulin Hour pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>140-280</td>
<td>0.34</td>
<td>0.06</td>
</tr>
<tr>
<td>200-300</td>
<td>0.35</td>
<td>0.06</td>
</tr>
<tr>
<td>160-200</td>
<td>0.35</td>
<td>0.06</td>
</tr>
<tr>
<td>None</td>
<td>0.07</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Discharge Barriers

- Diluted insulin
- Education to father
- University of Chicago labs- who pays?
- Weight checks- Home health nursing
- Coordination of appointments
  - Pulmonologist/Gastroenterologist/ Endocrinology visits

Finally HOME

- Daily contact with endocrine office- LOG BOOK
- Nurse Navigator Home Visit
- Weight Checks
- Blood sugar checks with each feed
- Updating on call physician with plan
- Parental support- hypoglycemia treatment
Weekend On-Call Report

Insulin pump orders:
Animas insulin pump: Humalog insulin dilution 1:10 which means it is 10 units per 1 ml.
Basal insulin actual insulin dose will be 0.01 units per hour
(for total amount of 0.24 units over 24 hours), this will equate to 0.1 on the insulin pump.
Bolus insulin through Animas insulin pump every 3 hours for feed:
20% immediate and remaining 80% over 30 minutes
Insulin on board: 3 hours

Below: treat with 0.4 ml sweeties sucrose water

<table>
<thead>
<tr>
<th>Blood Sugar Actual dose of insulin (dilute insulin 1:10)</th>
<th>How much to enter in pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 129</td>
<td>0.01</td>
</tr>
<tr>
<td>130 – 180</td>
<td>0.02</td>
</tr>
<tr>
<td>181 – 200</td>
<td>0.03</td>
</tr>
<tr>
<td>201 – 250</td>
<td>0.05</td>
</tr>
<tr>
<td>251 – 350</td>
<td>0.06</td>
</tr>
<tr>
<td>351 – 400</td>
<td>0.07</td>
</tr>
<tr>
<td>401 and up</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Hypoglycemia Treatment

- Glucagon Dosing:
  - 0.02 mg/kg
  - 0.1 mg of Glucagon in 1/100 syringe and draw up to 10 units
- Glucose tablet:
  - 4g carbohydrate
  - Dissolve in 4 ml of warm water
- Glucose gel:
  - 80% glucose
- Sweeties:
  - 24% sucrose
  - 24g/100ml

Protocol for infant diabetes

- Glucagon: 0.02 mg per kg. Reconstitute the glucagon with 1 ml. Use a 1 U syringe. 0.1 mg is equivalent to 10 units.
- Oral glucose: Crush a 4 mg glucose tab and dissolve into 5 ml of warm water. Make up to 40 ml every 2 days.
Who is this Nurse Navigator anyway?

- Communicate with in-patient hospital staff to facilitate post hospitalization follow up/ transition of care
- Coordinate education and facilitates initiation of treatment planning and all care
- Develops and implements case management plans to maximize healthcare outcomes and facilitate wellness
- Educates families/patients on chronic disease management, medications, and need for scheduled follow up appointments
- Assess patient via telephone or in person, applying critical thinking skills to facilitate proper level of treatment

Take-aways from this sweet baby

Know the right people in the right places to have a loaner pump
Assessing readiness to learn of parent, important to ensure that parent can absorb new knowledge
Coordinating and communication with all parties involved is key (ie PICU, DTC, parents)
Asking the “what ifs” and eliminating potential barriers will help the family feel confident on discharge

Follow Up

- MM neonatal testing came back
  - Positive for 6q24 TND, maternal hypomethylation, parents had genetic testing
  - No increased risk for future siblings above general population
- MM is now off insulin after 5 months, blood sugars 80-110s
- Follow up every 3 months
- Random blood sugar checks
References