Impaired Glucose Tolerance of Pregnancy: One Abnormal Value on the 100-Gram Oral Glucose Tolerance Test
Sweet Success Consultants

Impaired Glucose Tolerance of pregnancy is a problem name. Impaired Glucose Tolerance outside of pregnancy is now pre-diabetes, and/or also refers to an elevated value between 140-199 after at the 2 hour point on a 100-gram oral glucose challenge. During pregnancy, IGT refers to the woman that had only one abnormal number on a 100 gram, oral glucose test (OGTT). This woman has an abnormal screen, but did not have the two required elevations for a diagnosis of GDM. This gray area is associated with perinatal mortality and morbidity.

Numerous research studies have demonstrated increased perinatal risks associated with untreated IGT pregnancies (4, 7). These risks include: fetal macrosomia, hyper-insulinism, postpartum fetal hypo-glycemia, kernicterus, and increased admission to the NICU. Maternal risks include increased incidence of hypertension, preeclampsia and eclampsia, and surgical delivery (1,3,5,4,7,8,10,12).

A group out of Toronto, Canada, has looked at this one abnormal (IGT) from a new angle. They noted that an elevation at the 1-hour point produced outcomes similar to GDM (11). Elevations at the 2 and 3-hour end points did not produce the same outcomes. (Continued on page 2)

The Asian Body Mass Index (BMI)
Geetha Desai, RD, MS, CDE, CLE

Weight gain in adult life is associated with increased morbidity and mortality at increasing BMIs. Type 2 diabetes, cardiovascular disease and mortality are the most important sequelae of obesity and abdominal fatness. Although BMI is the most frequently used index, it does not reflect fatness uniformly in all populations. According to studies, in Asian populations, the risk association with diabetes and cardiovascular diseases occurs at lower levels of BMI when compared with the white population. Asians have more visceral adipose tissue causing higher insulin resistance despite having lean BMI. Asian Indians have a high risk of developing glucose intolerance with small increments in their BMI. A decision to use 23 as a BMI cut off Guidelines for Care will be updated with the Asian BMI cutoff value for overweight.
Impaired Glucose Tolerance of Pregnancy: One Abnormal Value on the 100–Gram Oral Glucose Tolerance Test

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One report of a prospective study published in the American Journal of Obstetrics and Gynecology 2002 (2) found “a striking similarity in terms of patient characteristics between the gestational diabetes mellitus group and the single value abnormality group.” These findings suggest that a single abnormal value on an oral glucose tolerance test should be regarded as a pathologic finding. The patient with a single abnormal value may be treated similarly to the patient with gestational diabetes mellitus. Further recommendations for care of the patient with one abnormal value reported in the Canadian Journal of Diabetes (6) include dietary assessment, medical nutrition therapy (MNT) and self monitoring blood glucose (SMBG).

Having reviewed this information we propose the following plan of care for women with one abnormal value on the 100 gram 3 hour oral glucose tolerance test:

Option A
• Women with one abnormal value on the OGTT should be scheduled with the RD for dietary assessment, education and meal planning, and with the RN for SMBG education and discussion of carbohydrate intolerance status and implications for the woman and her fetus. These women should have a follow-up visit in one to two weeks with the Sweet Success team for review of diet/SMBG.
• If all SMBG values are normal, the woman may opt to continue testing, fasting and post meals on a rotating basis, continue with diet and exercise, then follow-up in OB office during prenatal visits.
• The referring MD should be notified by letter when the patient is first seen and again after follow up evaluation. Individualized follow up recommendations are made at that time.

Option B
• An alternative approach from the above three-step plan, is to repeat the 3 hour OGTT two weeks from the date of the abnormal OGTT, or repeat at 30-32 weeks (9). If there is only one abnormal at repeat testing, we recommend dietary assessment, education and SMBG as described above.
• If completely normal not further testing is indicated.

References:

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Obesity Alone Increases Maternal and Perinatal Risk
Leona Dang-Kilduff, RN, MS, CDE

Obesity alone, without diabetes, is associated with macrosomia (1.6-2.6 OR) (3), shoulder dystocia (1.4-5.8 OR), pregnancy induced hypertension (2.38 adjusted odds ratio-OR), antepartum venous thrombosis (2.17 OR), wound infection (1.67OR), urinary tract infections (1.1-3.4 OR), spina bifida (3.5 OR), ophthalmomcele (3.3 OR) and heart defects (2.0 OR) (1,2,4). All of these complications increase neonatal admissions due to factors such as birth trauma, feeding issues and prematurity. Obese women also are more likely to have their labors induced (1.3-1.9 OR), which may lead to failed inductions and an increased risk of cesarean section (1.4-2 OR) (4).

We know through multiple research studies that intensive normalization of blood glucose significantly reduces macrosomia rates. Yet, macrosomia rates have remained higher in obese women than the normal population and slimmer women with gestational diabetes or IGT of pregnancy(3).

In a German study, Schaefer-Graf followed women with ultrasounds for fetal growth. She found that women with a BMI of ≥ 30 had significantly higher fetal abdominal circumferences, even with controlled blood glucoses. Here we see that blood glucose control is not the only issue.

This increased risk with obesity should be counseling point for pre-conception women.

Reference

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After reviewing its products and making decisions based on patient utilization of products, Eli Lilly announced in 2005 the discontinuance of the production of four insulin products: Iletin II pork (regular), Iletin II pork (NPH), Humulin U (ultralente) and Humulin L (lente). This means no animal insulins are available on the market.

Presently Humulin U is used by an estimated 22,000 people. Humulin L insulin is being utilized by 44,000. Lente insulin is occasionally used during pregnancy due to having a longer effect then NPH.

Without these long acting insulins, Lantus and NPH are the only longer-acting insulins available in the US market. For pregnancy we now have only NPH. Lantus has not been studied and has not recommended during pregnancy at this time.

Eli Lilly will potentially be pulling regular insulin next due to continued loss of its market share, which is, in turn, due to the popularity of insulin

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Web Resources

The year is ending and what a year it has been. Data for 2005 is due to your regional team. Please contact your team for final date.

Disappearing Insulin Options
Leona Dang-Kilduff, RN, MS, CDE

After reviewing its products and making decisions based on patient utilization of products, Eli Lilly announced in 2005 the discontinuance of the production of four insulin products: Iletin II pork (regular), Iletin II pork (NPH), Humulin U (ultralente) and Humulin L (lente). This means no animal insulins are available on the market.

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Diabetes Exercise and Sports Association
San Francisco Bay Area   Lesley Farrington desameeting@yahoo.com
San Pedro California   Maxine Lebowitz slebowitz@aol.com

Sweet Success  www.llu.edu/llumc/sweetsuccess  We now have information and materials on birth control, breastfeeding, affiliate list, conferences, data and more. Take a look!!

www.diabetesincontrol.com  A newsletter that is written for both professionals and the individuals with diabetes


California Dietetic Association Annual meeting- May 4-6, 2006 in San Diego. For more information visit the CDA website- www.dietitian.org

www.motherisk.org has both maternal and professional educational materials

Massachusetts General Reproductive Psychiatry Resources Center
www.womensmentalhealth.com
Insulin Adjustments  Leona Dang-Kilduff, RN, MSN, CDE

Most staff are well aware of adjusting insulin and/or food, based on patterns. This is called pattern management. But what happens when I have to develop an algorithm for that unstable type one client. Every client that adjusts insulin based on pre-meals should have an individualized algorithm based on a sensitivity factor and possibly insulin to carbohydrate ratios. Most women are given a set carbohydrate meal so carbohydrate ratios are not necessary.

A correction bolus/injection is based on a sensitivity factor. So how do you get it? First, add up all the insulin utilized in a 1 day. This is the total daily dose. Second, what type of rapid acting insulin does your client use? Humalog / Novolog Use 1800 OR Regular insulin use 1500. Take the number for the type of insulin and divide it by the total daily dose. For example, my client uses Humalog so the insulin rule to use is 1800.

\[
1800 = \text{the points in mg/dl that one unit of insulin will lower the glucose}
\]

TDD

And her total daily dose has increased as her pregnancy has progressed to 60 units per day.

\[
1800 = \text{30 mg/dl decrease with one unit of insulin}
\]

\[
60
\]

Women who are not on set carbohydrate meals will require Insulin to Carbohydrate Ratios. To calculate this, the 500 rule can be utilized. This is how many grams of carbohydrate are covered by 1 unit of rapid acting insulin.

Divide 500 by the total daily dose. So my example women takes 100 units of insulin per day.

\[
500 = \text{Number of grams of carbohydrate that is covered by 1 unit of Humalog}
\]

TDD

\[
500 = 5 \text{ grams of carbohydrate is covered by 1 unit of Humalog}
\]

\[
100
\]

This are only a jump off point. A women's sensitivity factor, as well as insulin to carbohydrate ratios will need to be recalculated as she increases her insulin needs during and decreases after pregnancy. A woman may need more in the AM and less in the PM, etc… Even sensitivity factors are affected by hormones, activity and so on.
Disappearing Insulin Options  

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analogs and better post-meal control. Pregnancy remains a concern with rapid acting insulin analogs on the market. Often decisions are made not to utilize an analog due to cost as all analogs are more expensive. Another concern is women entering pregnancy with an elevated Hgb A1c, which may increase her risk of potentially unstable retinopathy as women are crashed into tight control. This has been refuted in the literature but some health care providers have experienced rapid progression of retinopathy with pregnant clients and are reluctant to prescribe insulin analogs.

You can make a difference. If you are concerned that the insulin you prescribe is being or will be pulled off the market, you can phone, write or email Eli Lilly:

Customer Service: 800-545-5979
Mail: Marketing Department, Diabetes Team
       Eli Lilly and Co.
       Eli Lilly Corporate Center
       Indianapolis, IN 46285

Reference
Trecroci D. And then there were some: as the insulin market shrinks, how good and how safe are the remaining options? Diabetes Health. Feb 2006: 28-32.

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Insulin Administration During Antenatal Steroid for Lung Maturation Guidelines and Procedures

- All women should be admitted to hospital
- Monitor capillary blood glucoses every 2-4 hrs and hourly if in active labor
- Increased insulin requirements are anticipated
- Note diet treated clients may require insulin
- Regimen may vary with the urgency of delivery

Inulin Adjustments:

- Increase evening long-acting insulin by 20-40% on first day of steroids (day 0).
- Algorithm to correct as needed every 2-4 hours if not in active labor. Every hour if in active labor.
- On day 1 increase each meal and long acting insulin by 40-50%, 40-50%, 20-40%, and 10%. See algorithm to correct.
- Day 2 increased insulin same as day 1. See algorithm to correct.
- Day 3 cut to 75% of maximum doses. See algorithm to correct.
- Day 4 return to pre-steroid insulin doses.
In 1982 March of Dimes grant was awarded with the goal of improving diabetes and pregnancy outcomes in California:
- Could a Multi-faceted team approach obtain excellent glycemic control
- Will excellent blood glucose control reduce mortality and morbidity
- Would control before pregnancy for women with pre-existing diabetes reduce spontaneous abortions and congenital malformations
- By 1983 clients were being treated and outcomes were collected
- In 1984 –MCH grant was awarded
- To educate providers to manage women in California who have diabetes & wish to become pregnant
- Under the umbrella of the Perinatal Regionalization Programs of California (RPPC)
- Progress By 1992 to 2004:
  - Sweet Success had 8 regional programs all over California with 55 active affiliates and was providing care for 3,884 women/yr (2,555 with data)
  - Now 11 Regions, 200 + affiliates with approx 22,000 women/year and data  ~ 14,539
  - *Targets were HgbA1c of <7.5%, FBS <105 and post meal blood sugars of <160
  - *Now HgbA1c targets of <7% and FBS <100 and post meal targets of <135
  - By 1986-90 5051 women had been served and had outcome data. Of these 1182 had overt diabetes.
  - By 2001-04 served 31,322 and had outcome data. Of these, 402 women with type 1 diabetes and 2894 women with type 2 diabetes
  - Ethnic groups have consistently been Hispanic.
  - The Asian population has increased.
  - BMI rates have are comparable with increasing obesity rates

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Under weight</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td>Normal weight</td>
<td>24%</td>
<td>29%</td>
</tr>
<tr>
<td>Over weight</td>
<td>34%</td>
<td>24%</td>
</tr>
<tr>
<td>Obese</td>
<td>27%</td>
<td>43%</td>
</tr>
</tbody>
</table>

Hyperglycemia is a teratogen. So HgbA1c of:
- 6-12% rate of birth defects
- 3 - 4 -fold increase above background) when A1C > 7
- Normalizing blood sugar before and during organogenesis A1C < 7 can reduce the risk to background (1-3%)
- Kitzmiller JL, Diabetes Care, 1991
- Preconception care was and still is a goal of Sweet Success. From 1986-90, only 7% of eligible women received preconception care. In 2001-03, preconception care improved to 19%. Most women, even with diabetes, do not plan their pregnancies.
- Prenatal hospitalization decreased from 14% to 4%.

<table>
<thead>
<tr>
<th>Gestational DM</th>
<th>1986-91</th>
<th>2001-2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>669.2/yr = 3346 (28.9% insulin Rx)</td>
<td>31,322 (29.5% insulin, 5.9% glyburide in 2003)</td>
</tr>
<tr>
<td>Fetal deaths</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>BW &gt;4000 gm</td>
<td>23.9%</td>
<td>12%</td>
</tr>
<tr>
<td>Delivery &lt;37 wk</td>
<td>11.5%</td>
<td>11.0%</td>
</tr>
<tr>
<td>NICU days</td>
<td>30% or 3.2 hosp days on avg.</td>
<td>10% admitted NICU</td>
</tr>
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So where do we go from here? The Sweet Success program is looking at the future of our women with GDM. We know it is more then a pregnancy problem. It is the heralding of type 2 diabetes and or Metabolic Syndrome. GDM to type 2 Diabetes. Of our GDM women we expect 30% to develop diabetes by 5 yrs and 50% by 10 yrs if they do not modify their lifestyle. Kim et al, Diabetes Care 25:1862, 2002.

Once a woman has IGT the conversion rate is as high as 17% per year, Rattner, DPP.

Through multiple research papers we are very aware that the offspring of women with diabetes are also at risk.
- Small babies have the greatest risk for HTN, obesity, diabetes, cardiovascular and kidney disease
- Large babies have an increased risk for HTN, obesity, diabetes, cardiovascular disease and some cancers.

Hyperglycemia is a teratogen. So HgbA1c of:
Recommendations For Women After GDM

- Weight management (10 lbs decrease cuts risk in half)
- Exercise 30 minutes or more, 5 days a week
- Lower fat diet
- Breastfeed
- Do not smoke
- Avoid medications that decrease glucose tolerance
- Avoid progestin only birth control
- Have lipid screening at 1 year and treat
- Glucose screen annually and before next pregnancy
- Discuss future pregnancies

CONFERENCES

May 8, 2006. Sweet Success Community Affiliate Training, Salinas, California. For information call Daychin or Leona at 650-723-576.

June 6 and 7, 2006. Sweet Success Affiliate Training, Miller Children's Hospital, Long Beach, California. For information call 562-595-6459


August 1 and 2nd, 2006. Diabetes and Pregnancy Affiliate Training Western Medical, Santa Ana. For information please call 714-456-6706


May 4-6, 2006. California Dietetic Association Annual meeting. San Diego, CA. For more information visit the CDA website- www.dietitian.org

**Sweet Success Express is our sister and we offer Affiliate discounts for classes to Associate Members**