The continuum of glucose intolerance in women

Neil Murphy, M.D.
Women's Health Service, Southcentral Foundation

Barbara Stillwater, Ph. D, R.N.
Alaska Diabetes Prevention and Control Program

Objectives

- Understand some of the different factors affecting glucose intolerance throughout a woman's lifespan
- Understand some of the moments of opportunity to improve glucose tolerance
- Describe clinical and public health management strategies to improve glucose tolerance

Glucose Intolerance in women:
From cradle to grave

Neil Murphy, M.D.
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Glucose Intolerance in women

Does it start with the chicken or the egg?

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Women's Health Service, Southcentral Foundation

Barbara Stillwater, Ph. D, R.N.
Alaska Diabetes Prevention and Control Program

Does it start with the chicken or the egg?

YES

Team Effort

- Barbara Stillwater
- Carol Treat
- Irene Jordet
- Deborah Evans
- Meera Ramesh

The egg and the cradle

- Infants of diabetic mothers (IDM)
  - increased risk of developing diabetes
- Genetically determined (egg)
- Intrauterine environment (cradle)

The egg: Genetic lifelong risk

- Type 1 DM
  - 6 % in offspring
  - 5 % in siblings
  - 30 % in identical twins
  - (0.4 percent in subjects with no family history)

- Redondo MJ et al BMJ 1999 Mar 13;318(7185):698-702

The egg: Genetic lifelong risk

- Offspring of diabetic fathers > mothers
  - Type 1 diabetes (6.1 vs 1.3 percent)*

- Type 2 DM
  - 5 - 10x higher - 1st degree relative of a patient with type 2**

*Warram JH N Engl J Med 1984 Jul 19;311(3):149-52

**Bennett, PH. Diabetes Mellitus, Rifkin, H, Porte, D Jr (Eds), Elsevier, New York 1990. p.363.

The cradle (a.k.a. intrauterine exposure)

<u>Theory</u>

Exposure to hyperglycemia and hyperinsulinemia may affect the development

- adipose tissue
- pancreatic beta cells

Leading to future obesity and altered glucose metabolism

The cradle:
Fuel-mediated teratogenesis

- ‘Accelerated starvation’: Fuel withheld
- ‘Facilitate anabolism’: Fuel ingested
- Finely tuned to maternal fuel economy
- Sensitive: Mild limitations in insulin reserve (GDM)
- Teratogenesis: Subsequent to organogenesis
  - During differentiation and proliferation
- Long-range:
  - Behavioral, anthropometric, metabolic

- Freinkel N Diabetes 1980

The cradle (a.k.a. intrauterine exposure)

Test:

- Outcomes in infants of mothers with either type 1 or type 2 diabetes

- Accelerated Starvation
  - Freinkel N Diabetes 1980 Dec;29 (12):1023-35

- Accelerated growth and abnormal glucose tolerance in young female rats exposed to fetal hyperinsulinemia.
  - Cha CJ; Gelardi NL; Oh W Pediatr Res 1987 Jan;21(1):83-7.

The cradle: Macrosomia

- Present at birth
- Resolved by one year of age
- Obesity recurred in childhood
  - Greater BMI in offspring of diabetic mothers than controls
  - (24.6 versus 20.9 kg per m^2)

The cradle: Increased high body mass

- Macrosomic offspring of mothers with gestational diabetes
  - Increased incidence of high body mass
  - 4 to 7 y.o.

The cradle: Obesity

- Offspring of diabetic women
- Normal birth weight
- 5 to 19 years of age
  - Higher mean weight relative to height than do offspring of nondiabetic and prediabetic women

The cradle: Impaired glucose tolerance

- 36 % of offspring of diabetic mothers
- Associated with elevated amniotic fluid insulin concentrations

The cradle: Type 2 diabetes

- Type 2 diabetes occurs more often in
  - IDMs offspring 45 %
  - Prediabetic offspring 8.6 %
  - Nondiabetic offspring 1.4 %

The cradle: Vicious cycle

- Most of the increase in diabetes prevalence in Pima Indian children over the past 30 years
  - Increasing weight
  - Increasing frequency of exposure to diabetes in utero
- Type II diabetes
  - Increased dramatically over time
  - Along with increasing weight
  - Common disease in AI children aged 10 or more

The cradle: Vicious cycle

Conclusion

- A vicious cycle related to an increase in the frequency of exposure to diabetes in utero appears to be an important feature of this epidemic.

DM in Pima children 1967-1976 vs 1987-1996

- Boys
- 10-14 year old age group
  - 0 % to 1.4%
- 15-19 age group
  - 2.43% to 3.78%
- Girls
- 10-14 year old age group
  - 0.72 % to 2.88 %
- 15-19 year age group
  - 2.73 % to 5.31 %

- Dabelea D et al Diabetologia 1998 Aug;41(8):904-10

The cradle: Mechanism

- Exposed subjects have IGT
  - 5 of 15 vs 0 of 16
- Defective insulin secretory response vs control
- Levels of pancreatic polypeptide were low in exposed subjects with IGT
- Possible mechanism low parasympathetic drive to the pancreas

The cradle: Mechanism

- Adult offspring of mothers with type 1 diabetes are at increased risk of IGT and a defective insulin secretory response
- Independent of genetic predisposition to type 2 diabetes.
- 31 non-diabetic adults
  - 15 were born to mothers with type 1 DM (exposed)
  - 16 not exposed, but fathers had type 1 DM (controls)
- Sobngwi E; et al Lancet 2003 May 31;361(9372):1861-5

Possible pre-diabetes crux points

- Gestational diabetes
- Postpartum
- PCOS
- Metabolic Syndrome

Case scenario

- SK 38 yo G8P7006 presents at 24 wks by her dates
- OB HX 3 infants > 9 pounds
- Last NSVD 10 lb. 8 oz. stillborn
- Difficult labor: baby’s head came out, shoulders didn’t want to come out

Classification

<u>Non-Pregnant</u>

- Type I: Insulin dependent
  (*Absolute* insulin deficiency)

- Type II: Non-insulin dependent
  (*Relative* insulin deficiency)

Classification

Pregnancy

- Pre-gestational: Carbohydrate intolerance diagnosed prior to pregnancy
- 1st Trimester Gestational Diabetes
- Gestational Diabetes: Carbohydrate intolerance with onset or first recognition during pregnancy

CCC CORNER
NATIONAL COUNCIL OF CHIEF CLINICAL CONSULTANTS
Focus on the Health of American Indians and Alaska Natives

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A new diagnostic category: 'First Trimester GDM'

THIS MONTH

Here is a common question

Does my patient have gestational diabetes or did she have previously undiagnosed diabetes?

34.7 kg/M2. Her three prior children all weighed over 9 pounds, but her deliveries were uncomplicated. She thinks she may have been told she had GDM with her last pregnancy, but never followed

Due to required summer hiking activities there will be no CCC Corner arriving in your mailbox in July. The next CCC Corner will

White System - Gestational

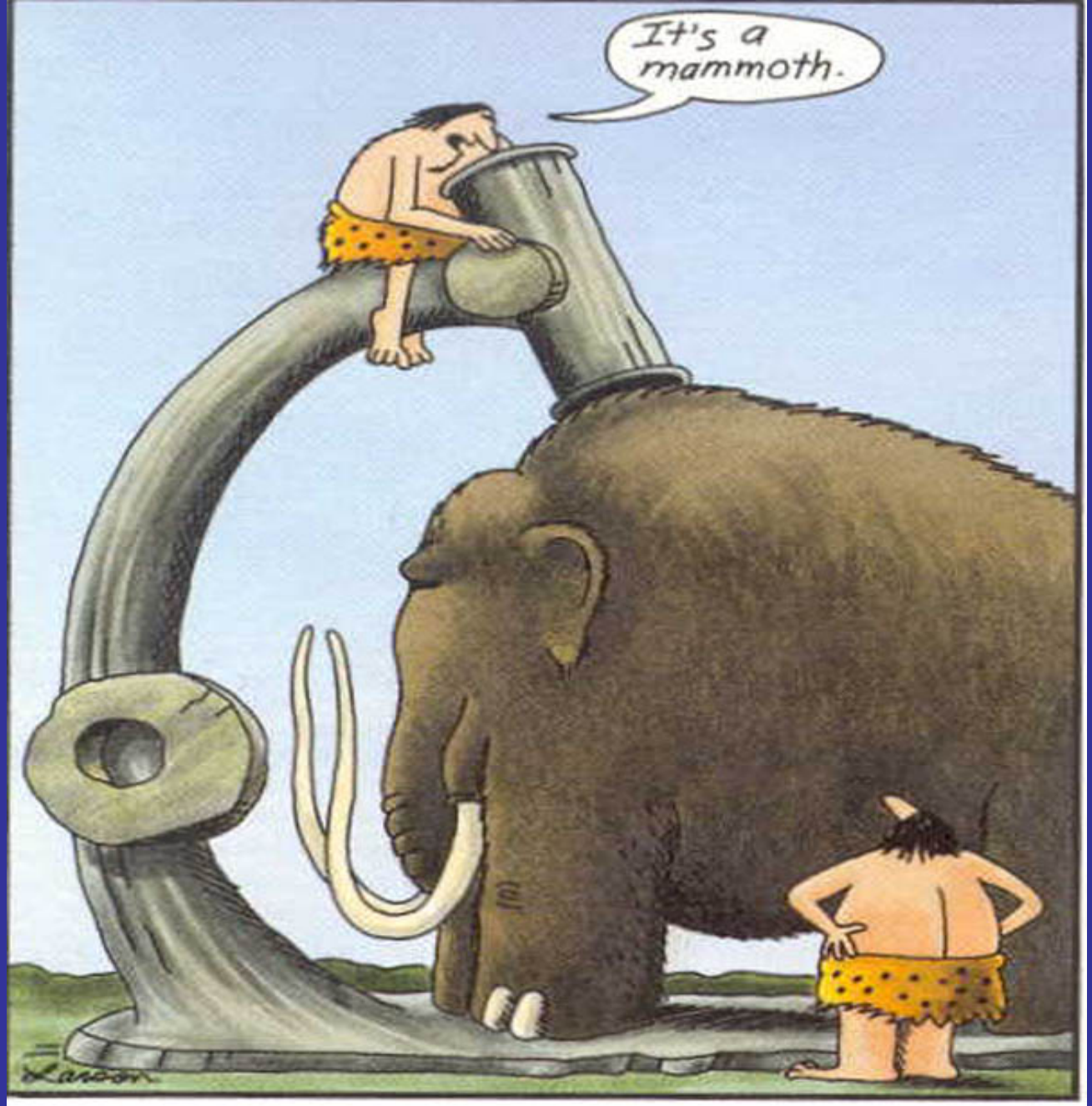
CLASS	ONSET	FBS	2º PP	THERAPY
A1	Gestational	<105 mg/dl	<120 mg/dl	Diet
A2	Gestational	>105 mg/dl	>120 mg/dl	Insulin

White System - Pre-gestational

CLASS	AGE	DURATION	VASCULAR	THERAPY
B	>20	<10	None	Insulin
C	10-19	10-19	None	Insulin
D	<10	>20	Benign eye	Insulin
F	Any	Any	Nephropathy	Insulin
R	Any	Any	Proliferative eye	Insulin
H	Any	Any	Heart	Insulin

Complications of Diabetes in Pregnancy

- <u>GDM</u>
  - Macrosomia and related problems (maternal and fetal)
- <u>Insulin Requiring Diabetes</u>
  - Anomalies
  - Macrosomia
  - Placental insufficiency
    - IUGR
    - Fetal Compromise



Early microscopes

Prevalence

GROUP	RATE GDM%
U.S.	4.0-7.0
Hispanic	3.0
Sacaton	10.0
GIMC	7.0
White River	9.0
Zuni	16.0
Bemidji	8.0
Bethel	6.1

Screening

- Pre-Gestational - DO NOT SCREEN
- Non-Native - Selective Screening
  - Low Risk - No Screening
    - < 25 years old
    - Normal body weight
    - No diabetes in first degree relatives
    - Not a member of ethnic/racial group with high prevalence
    - No history of abnormal glucose tolerance
    - No history of poor obstetric outcome

High Risk Factors

- Previous infant > 4000 gms (8 lb. 14 oz)
- First degree relative
- BMI > 25
- Past: GDM, still birth, SAB x3, anomalies
- Current: > 35 yo, polyhydramnios,

  »persistent glycosuria

Management

- Management of pre-gestational diabetes and insulin requiring GDM is more intensive because of increased risk to the fetus
- Approximately 90% of diabetics in pregnancy are non-insulin requiring

Case Continued

- Mrs. K's 3-hour glucose tolerance test showed:
-

FBS	108 mg/dL
1 hour	198 mg/dL
2 hour	229 mg/dL
3 hour	129 mg/dL

GDM - Initial Management

- Diet
  - Fulfill minimum requirements for pregnancy
  - Culturally appropriate
  - Restrict carbohydrates to 35-45% of total caloric intake
  - Utilize complex carbohydrates
  - Level C recommendation

Initial Management

EXERCISE

- Lowers FBS and post prandial levels
- Optimal type, duration and frequency unclear
- Aerobic, 20 min, 3x/week
- Level I data

GDM - Followup

Glucose Monitoring - Home vs Clinic

- Initiate insulin if FBS >105, 2hr > 120

Fetal kick counts

Antepartum testing at 40 weeks

Deliver after 38 completed weeks

Repeat Ultrasound at 28-32 weeks

Case continued

- Mrs K returns after 2 weeks on diet and exercise therapy with this glucose log
- FBS: 98-121
- 2 hr pp 131-203
- 2 hr pp lunch 123-129
- 2 hr pp dinner 122-128

Insulin Requiring - Initial

- Diet
- Exercise
- Assess renal function (Level B)
- Eye exam (Level B)
- Education
- Ultrasound
- ? EKG, HgAlc
- Insulin

Insulin Therapy

- Goal is euglycemia
- Home monitoring is essential
  - FBS and 2 hours post prandial
  - 1 hour pp < 130 mg/dL (Level I data)
- Initiation of therapy
  - Single dose of long acting (e.g., 20u NPH), or
  - 0.7 units/kg in divided doses (2/3 and 1/3)

Oral Agents

- Glyburide
  - Single RCT indicating it is a reasonable treatment for insulin requiring GDM (Langer et al, NEJM, 10/19/2000)

- Multiple Small Case Control Studies, Case Reports
  - Historical
  - South Africa
  - United Kingdom, rural

Intrapartum Management

- GDM - Non-insulin requiring
  - Routine
- Insuling requiring
  - Goal is euglycemia (80-110) to avoid neonatal complications
  - Monitor q 1-4 hours
  - Monitor for ketonuria q void
  - Insulin/dextrose as needed

Case continued

- Mrs K cervical ripening scheduled at 38 wks.
- Insulin drip
- NSVD 8 lb 2 oz girl Apgars of 9 and 9
- Baby’s heel-stick glucose is 42 mg/dL
- Above 40 mg/dL hourly over the next 4 hrs.

Post Partum - General Concepts

- Non pregnant “normal” levels higher
- “Honeymoon” period - insulin requirements markedly decreased
- Lactation has beneficial effect on glucose tolerance and subsequent development of type 2 diabetes

Immediate Post Partum

- Non-insulin
  - Routine
- Insulin requiring
  - Monitor FBS, 2° PP
  - Reinstitute insulin conservatively
  - Follow-up in 1-2 wks to adjust insulin / change to oral hypoglycemic

Post Partum - 6 weeks

- Gold standard
- 75 gm, 2 hr OGTT
  - Fasting ≥ 126 mg/dL and/or 2 hr ≥ 200 mg/dl
  - Impaired fasting glucose > 100 and < 126*
  - Impaired glucose tolerance > 140 and <200*

  - * Pre-diabetes

Post Partum

Alternative, slightly less accurate

- FBS
  - ≥ 126 x2 - Diabetes
  - 100-125 - Impaired fasting glucose
    - (Pre-diabetes)
  - <100 - Normal

Post Partum - Long Term

- GDM: q 3 year glucose screening
- Lifestyle modification
- Preconceptual counseling
- Contraception
- Offspring risks

Family Planning

- OCPs
- Depo-Provera
- IUD
- All barrier methods
- Sterilization

Pre-conception counseling

- Folic acid
- Maintain euglycemia / SABs (Level B)
- Avoid teratogens
- Healthy behavior
- Safer sex

The bad news…

- Systematic literature review: subjects underwent testing for GDM and testing for type 2 DM after delivery
- Cumulative incidence of type 2 diabetes, and factors that predicted incidence of type 2 diabetes
- 28 studies were examined

- Kim C et al Gestational diabetes and the incidence of type 2 diabetes: a systematic review. Diabetes Care 2002 Oct;25(10):1862-8

Writer’s Embellishment

- Hyperglycemia and Pregnancy Outcomes (HAPO)
- International Association of Diabetes and Pregnancy Study Groups

- N Engl J Med. 2008 May 8;358(19):1991-2002

Hyperglycemia and Pregnancy Outcomes

- 25,505 pregnant women
- 15 centers in 9 countries
- 75-g OGTT at 24 to 32 weeks
- Blinded if….
- Fasting plasma glucose < 105 mg and
- 2-hour plasma glucose < 200 mg

Primary outcomes

- Birth weight > 90th percentile
- Primary cesarean delivery
- Clinically neonatal hypoglycemia
- Cord-blood C-peptide > 90th percentile

Secondary outcomes

- Delivery < 37 weeks
- Shoulder dystocia
- Birth injury
- Intensive neonatal care
- Hyperbilirubinemia
- Preeclampsia

Results

- 23,316 participants with blinded data
- Fasting plasma glucose of 1 SD (6.9 dL)
- 1-hour plasma glucose of 1 SD (30.9 dL)
- 2-hour plasma glucose of 1 SD (23.5 dL)

Results

- Birth weight > 90th percentile: 1.38, 1.46, 1.38
- C-peptide > 90th percentile: 1.55, 1.46,1.37
- Primary cesarean delivery: 1.11, 1.10,1.08
- Neonatal hypoglycemia: 1.08*, 1.13, 1.10*

- No obvious thresholds at which risks increased
- Significant associations were also observed for secondary outcomes, though weaker

- *(0.98 to 1.19), (1.00 to 1.12)

CONCLUSIONS

- Strong, continuous associations
- Maternal glucose levels below those diagnostic of diabetes
  - Birth weight
  - Cord-blood serum C-peptide levels

Pasadena: June 11-13, 2008

- International Workshop Conference on Gestational Diabetes Diagnosis and Classification

C-peptide: proxy for fetal insulinemia

- Primary outcome variable because in theory the higher the cord insulin the more likely it is that mother had high glucose concentrations which crossed to the fetus
- ~15% of cord specimens will hemolyze
- Hemolysis lowers plasma insulin concentrations, whereas it does not affect c-peptide
- Strong correlation between c-peptide and insulin

Maternal OGTT

- Strong association between increasing maternal OGTT results at all three times; fasting, 1-hr, and 2 -hr vs cord c-peptide levels in the neonate but…
- Highest correlation with fasting and the 1 hour
- High c-peptide associated with neonatal hypoglycemia following birth

Maternal OGTT

- There appeared to be agreement that the 75 gm (rather than the 100 gm) OGTT may be preferred for GDM diagnosis through out the world

- Only 1 abnormal result maybe needed to diagnose GDM

Maternal OGTT

- Majority opinion that within the definition of GDM there should be a designation of those who have overt DM (eg FPG >126)

- Thus we should be able to diagnose type 2 (and rarely type 1) during pregnancy

Maternal OGTT

- Pregnant FPG > 90 had the highest correlation with adverse outcomes
- One hour >179 associated with a significantly increased risk of adverse outcomes
- Two hours > 140 associated with a significantly increased risk of adverse outcomes

The bad news…

- Cumulative incidence of diabetes
  - 2.6% at 6 weeks
  - Over 70% at 28 years postpartum
- Adjustment for various lengths of F/U and testing rates
  - women progressed to type 2 DM at similar rates

The bad news…

- Cumulative incidence
  - Increased markedly in the first 5 years
  - Reached plateau after 10 years

- An elevated FBS during pregnancy was risk factor most commonly associated with future risk of type 2 DM

The bad news…

- Conversion of GDM to type 2 diabetes varies with the length of follow-up and cohort retention
- Rapid increases in the cumulative incidence occurring in the first 5 years after delivery
- Target women with elevated FBS during pregnancy

Would such a miracle…

- Involve rocket science?

Would such a miracle…

- Involve Jenny Craig?

Exercise: GDM and prevention

- DM and its complications have reached epidemic proportions among North American Aboriginal peoples
- Changes in diet and activity levels associated with a shift away from traditional lifestyles
- Aboriginal communities may be able to reduce disease by incorporating exercise programs into their public health programs

Exercise: GDM and prevention

- Pilot project in Saskatoon, Saskatchewan
- Evaluate the effect of exercise in preventing GDM
- Reduce the risk of developing NIDDM for both women and their offspring

- Dyck RF et al Preventing NIDDM among aboriginal people: is exercise the answer? Description of a pilot project using exercise to prevent gestational diabetes. Int J Circumpolar Health 1998;57 Suppl 1:375-8

How can exercise help?

- Contracting skeletal muscle can increase its glucose uptake 35-fold

- Insulin resistance decreases following aerobic exercise

What does the research show?

- Randomized control trials
- Physical activity reduces the risk for development of Type 2 Diabetes
- Exercise decreases blood glucose
- Exercise is safe for fetus

Exercise program during pregnancy may be more successful

- Women are generally motivated to make changes necessary for the health of the unborn child
- Time required for beneficial intervention is months, not years
- May have a positive ripple effect on family and community

Exercise guidelines for women with GDM

- Measure blood glucose pre and post exercise
- Monitor fetal activity
- Moderate aerobic exercise 20-30 minutes after eating
  - stationary cycling, walking, swimming
  - 50% VO2 max (Perceived exertion of fairly light to somewhat hard)
- Warm up before and cool down after exercise
- Drink plenty of water
- Have snacks near by just in case

SOGC/CSEP Clinical Practice Guideline (June 2003)

- All women without contraindications should be encouraged to participate in aerobic and strength conditioning exercises as part of a healthy lifestyle during their pregnancy
- Reasonable goals of aerobic conditioning in pregnancy should be to maintain a good fitness level throughout pregnancy without trying to reach peak fitness or train for an athletic competition

SOGC/CSEP Guideline (continued)

- Women should choose activities that will minimize the risk of loss of balance and fetal trauma
- Women should be advised that adverse pregnancy or neonatal outcomes are not increased for exercising women
- Initiation of pelvic floor exercises in the immediate postpartum may reduce the risk of future urinary incontinence

SOGC/CSEP Guideline (continued)

- Women should be advised that moderate exercise during lactation does not affect the quantity or composition of breast milk or impact infant growth

Relative contraindications to exercise

- Previous pre-term birth
- Mild/moderate cardiovascular disorder
- Mild/moderate respiratory disorder
- Anemia (Hgb<10.0 gm)
- Malnutrition or eating disorder
- Twin pregnancy after 28th week
- Other significant medical conditions

Absolute contraindications for exercise

- Ruptured membranes
- Pre-term labor
- Hypertensive disorders of pregnancy
- Incompetent cervix
- Growth restricted fetus
- High order multiple gestation (>= triplets)
- Placenta previa after 28th week
- Persistent 2nd or 3rd trimester bleeding
- Uncontrolled type I diabetes, thyroid disease, or other serious cardiovascular, respiratory, or systemic disorder

Services available at ANMC

- Physical Therapy
  Musculoskeletal issues (e.g., pelvic pain)

- Health Education – Exercise Program
  - Exercise during healthy pregnancy
  - Supervised exercise for GDM patients
  - Healthy pregnancy class

Appendix F
Exercise guidelines to improve glucose control

ype of activities:
Aerobic activities such as walking, stationary cycling, or swimming
requency:
At least 3 days per week
uration:
20-45 minutes per session
tensity:
Moderate. The "talk-sing test" may be used – the patient should be able to talk while exercising; if she can sing, the pace can be increased. If using rating of perceived exertion (RPE) exertion level should feel "fairly light" to "somewhat hard".
Patient should warm-up before and cool down after exercise, drink plenty of water, and have snacks nearby if needed.
itial exercise consult:
Assessment of current physical activities and level of readiness for exercise
Education/Information on exercise and GDM
Individualized exercise plan
upervised exercise:
Measure blood glucose pre and post exercise
Exercise on treadmill and/or recumbent cycle
Monitor perceived exertion
Monitor blood pressure and/or heart rate as needed

Physical activity: Pregnancy

- Adjusting for age, race or ethnicity, history of GDM, family history of diabetes, and prepregnancy BMI
- Any vigorous physical activity in the year before pregnancy
- Reduced risk of GDM
  - OR 0.56, 95% CI 0.33-0.95)
- Reduced risk abnormal glucose tolerance
  - OR 0.76, 95% CI 0.57-1.00

- Oken E et al Obstet Gynecol. 2006 Nov; 108(5):1200-7

Physical activity: Pregnancy

- Women with vigorous activity before pregnancy and light-to-moderate or vigorous activity during pregnancy had lower risk of both….
- GDM
  - OR 0.49, 95% CI 0.24-1.01
- Abnormal glucose tolerance
  - OR 0.70, 95% CI 0.49-1.01
- Walking and total physical activity provided modest benefits..

Physical activity: Pregnancy

- Vigorous activity before pregnancy
- Light-to-moderate activity during pregnancy
- Reduces risk for abnormal glucose tolerance and GDM

How does breastfeeding fit in?

- Gila River Pima Indian Community
- 2 months or longer 40% risk reduction for the baby developing DM by age 40

  Pettitt D Lancet. 1997; 350:166-168

- Reduced diabetes risk for Native Canadian babies if they were breastfed

  Young TK et al Arch Pediatr Adolesc Med. 2002; 156:651-655

How does breastfeeding fit in?

- Health surveys of almost ¼ million nurses
  - 14-15% less DM 15 years later

- Possible causes
  - maternal metabolic cost of breastfeeding
  - endocrine responses with breastfeeding

- Stuebe AM et al JAMA. 2005; 294:2601-2610

How does breastfeeding fit in?

- Breastfed babies have less risk of obesity and overweight for children and adolescents
- Reduced risk of obesity for children and adolescents and offspring of GDMs
- Protective effect against later obesity and overweight

How does breastfeeding fit in?

- Human hormones, leptin, ghrelin, and insulin are found only in breast milk.
  - Appetite, satiety and blood sugar
- Eating behavior that is learned could shape later eating patterns
  - Breastfed babies control their own intake.
- Breastfed babies gain weight differently than formula fed babies.
  - Early weight gain patterns that are unique to breastfed infants as being protective of obesity

How does breastfeeding fit in?

- Since breastfed babies tend to be leaner as they grow up, the moderation of obesity/overweight could be the difference in diabetes risk

- Prevent or delay the onset of diabetes. Moderate weight loss (7%) was a key factor in reducing risk

Diabetes Prevention Program

- 3234 subjects, randomly assigned
- Obese (BMI 34 kg/m2)
- Ages 25 to 85 years (51 yo)
- High risk for diabetes
  - BMI $\geq$ 24 kg/m2
  - Fasting glucose 96 to 125 mg/dL
  - 2 hour glucose and 140 to 199 mg/dL

Diabetes Prevention Program

- Intensive lifestyle changes
  - Reduce weight by 7 %
  - Low-fat diet
  - Exercise for 150 minutes per week
- Metformin (850 mg BID) plus information on diet and exercise
- Placebo plus information on diet and exercise

Diabetes Prevention Program

- Diet and exercise group*
  - Lost 15 pounds (6.8 kg) or 7 % of weight in the first year
  - Three years: fewer patients developed diabetes
  - 14 vs 22 and 29 % in the metformin and placebo groups
- Lifestyle intervention was effective in men and women in all age groups, and in all ethnic groups

*Terminated early at 3 years

Diabetes Prevention Program

- Weight loss vs diet change vs exercise
  - Diabetes prevention correlated strongly with weight loss
  - 16 % reduction in DM for every Kg lost

- Improved insulin sensitivity and insulin secretion
  - Greatest in the intensive lifestyle intervention group
  - Somewhat lower in the metformin group
  - Correlated directly with decreased risk of diabetes

Modifiable Risk Factors in Previous GDM

- Cross-sectional, nonpregnant women, 2003
- Behavioral Risk Factor Surveillance System
  - Previous GDM only
  - Current diabetes
  - No diabetes

- Yun S et al Modifiable risk factors for developing diabetes among women with previous gestational diabetes. Prev Chronic Dis 2007 Jan

Modifiable Risk Factors in Previous GDM

- 7.6% had current self-reported physician-diagnosed diabetes
- 1.5% had previous GDM only

Modifiable Risk Factors in Previous GDM

- Previous GDM only had higher prevalence
  - no leisure-time physical activity (32.0% vs 25.7%)
  - overweight (62.2% vs 49.0%)
  - obesity (29.4% vs 20.0%)

- Adjusting for sociodemographic variables
  - no LT physical activity (POR, 1.4; 95% [CI], 1.2–1.7)
  - overweight (POR, 1.8; 95% CI, 1.6–2.2)
  - obese (POR, 1.7; 95% CI, 1.4–2.1)

Modifiable Risk Factors in Previous GDM

- Previous GDM are more likely to have modifiable risk factors for developing DM
- More attention is needed from providers and public health officials
  - promotion of healthy lifestyles during and after pregnancy

Chronic Disease Management

- Role Oriented Access Management (ROAM)
- Patients to enter data about their own conditions
- Interact with healthcare providers via the Internet
- Provide advice to manage the patient's condition

- Atlantic Health Sciences Corporation in New Brunswick, Canada

Role Oriented Access Management

- Provide healthcare professional with easy remote access to patient data
- Lab results, chart notes, and imaging studies
- ROAM meets HIPAA regulations
- Used in more than 60 healthcare systems in Canada and US

Role Oriented Access Management

- Enter daily blood sugars
- Online education portals
- Chat rooms to talk to other pts
- Pleased someone is paying attention to their daily entries
- Online classes: Convenient way to learn

Predictors of insufficient activity

- Self-reported leisure-time physical activity in 1442 women
  - before pregnancy
  - during the second trimester
  - 6 months postpartum

- Pereira MA, Rifas-Shiman SL, Kleinman KP, et al. 2007. Predictors of change in physical activity during and after pregnancy: Project Viva. *American Journal of Preventive Medicine* 32(4):312-319

Predictors of insufficient activity

- Postpartum weight retention
  - 34% were overweight or obese before pregnancy
- Working longer hours during pregnancy and postpartum ($\geq$ 35 hours per week)
  - 60% during the second trimester
  - 30% at 6 months postpartum
- Child care was a barrier to physical activity
  - 1.58 OR women with at least one child vs no children

Predictors of insufficient activity

- Prevalence of insufficiently active lifestyle increased from
  - 12.6% pre-pregnancy
  - 21.6% during pregnancy
  - 21.7% during the postpartum period

Predictors of insufficient activity

- Walking: Popular and practical
- Easily worked into the daily routine (e.g., pushing child in stroller)
- Reduces other disease risks, too

Predictors of insufficient activity

Conclusion:

- Walking appears to be a….
- Relevant targeted activity for interventions
  - During pregnancy

    AND
  - Following pregnancy

Stanford Self-Management Programs

- Chronic Disease Self-Management Program
- Workshop where people with different chronic diseases attend together
- Teaches the skills needed in the day-to-day management / treatment
- Maintain and/or increase life's activities
- http://patienteducation.stanford.edu/programs/

Resources

- Online Guidelines
- www.ihs.gov/MedicalPrograms/MCH/w/Documents/DMPreg102504_000.doc

- Perinatology Corner Modules
  - Screening and Diagnosis
  - www.ihs.gov/MedicalPrograms/MCH/M/DP01.asp#top
  - Management and Postpartum
  - www.ihs.gov/MedicalPrograms/MCH/M/DP21.asp#top

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Focus on the Health of American Indians and Alaska Natives

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Women's greater risk of dying after surgery: Transfusion-related immunosuppression

Women are more likely to die than men after surgery. A new study suggests it may be due to blood transfusion-related immunosuppression. Women tend to have lower hematocrit and hemoglobin than men and therefore are more likely to receive transfusions during surgery. Indeed, the study of Michigan Medicare patients found that women undergoing CABG were 3.4 times as likely to have received blood as men and generally received more units of

1998. The study was supported in part by the Agency for Healthcare Research and Quality (HS11540).

Rogers AM et al Allogeneic blood transfusions explain increased mortality in women after coronary artery bypass graft surgery December 2006 American Heart Journal 152, pp. 1028-1034

OB/GYN CCC Editorial

Postoperative infection is increased with

THIS MONTH

2007 National Women's Health and MCH Conference is a huge success

The conference, which last

Objectives

- Understand some of the different factors affecting glucose intolerance throughout a woman's lifespan
- Understand some of the moments of opportunity to improve glucose tolerance
- Describe clinical and public health management strategies to improve glucose tolerance


Yep. There it is...
It's definitely a boy.
Reynolds