PCOS & The Bariatric Surgery Patient

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Objectives
1) Define diagnostic criteria for polycystic ovary syndrome (PCOS)
2) Describe characteristics of PCOS patients
3) State the medical nutrition therapy goals in treating PCOS
4) Describe how bariatric surgery influences treatment of PCOS

Case Study #1
- HF – 44 yr F, BMI 47.9
- PMH: s/p band with failure to lose weight, PCOS 2009, sleep apnea, migraines
- Labs: HbA1C 4.8
- Medication: Metformin, Omega-3, Levothoxine, vitamin A 10,000 IU, vitamin D 3,000 IU
- C/o: not eating a lot but can’t lose weight, including with the band
- Eating habits: high CHO meals and snacks, doesn’t cook

Counseling nuggets:
1) Collaborate with outside dietitian
2) Minimize supplementation
3) Act as the expert to build trust
4) Easy to prepare meals balanced with CHO + PRO

What is PCOS?
- Compilation of symptoms
- Specific molecular mechanism unknown
- Polygenic
- Phosphoglycan D-chiro-inositol
- Insulin receptor phosphorylation pathway
- Increase in GnRH and LH, decrease in FSH

Cycle of Obesity with PCOS
- Insulin – insulin resistance  \rightarrow  increased insulin production  \rightarrow  weight gain
- Leptin – overweight  \rightarrow  fat cells produce leptin  \rightarrow  feel hungrier  \rightarrow  weight gain
- Ghrelin – higher than normal levels  \rightarrow  feel hungrier, not satisfied as much  \rightarrow  increase portions  \rightarrow  weight gain

Health Risks of PCOS
- Metabolic syndrome
- Type 2 diabetes
- Hypertension
- Hyperlipidemia
- Sleep apnea
- Endometrial and uterine carcinoma
- Cardiovascular risks including stroke and coronary heart disease
- Most frequent cause of female infertility
- Postpartum complications

https://courses.washington.edu/conj/bess/reproductive/pcos.htm
Health Statistics

- 3x the risk of diabetes, stroke, and heart disease
- 2x the risk of anxiety, depression, and drug use
- 2x the risk of hospitalization for any cause
- 10x the risk of infertility
- 4 billion dollars spent annually in US

Who has PCOS?

- ~10% of women have been diagnosed with PCOS
- ~70% of cases are not diagnosed or treated
- 60% of patients diagnosed with PCOS are obese
- More likely in patients reporting obesity before 18 yo

- Bariatric Specific Population:
  - 13% of bariatric patients have been diagnosed with PCOS
  - Likely underdiagnosed
  - ~42% of bariatric patients report history of infertility

Diagnostic Criteria

Rotterdam Criteria (2 of the following):

| Hyperandrogenism | Clinical examination: Hirsutism, acne, androgenetic alopecia, and acanthosis nigricans
|                  | Laboratory values: high circulating levels of testosterone and androstenedione |
| Menstrual Irregularity | Clinical examination: oligomenorrhea or amenorrhea
|                     | Laboratory values: high circulating levels of lutetinating hormone |
| Polycystic Ovaries on Ultrasonography | >= 12 follicles in each ovary
|                          | Follicle size between 2 and 9 mm +/- >10 ml ovarian volume |

Clinical Presentation

- Hirsutism
- Hair thinning & loss
- Acne
- Skin tags
- Acanthosis nigricans
- Menstrual irregularities
- Central adiposity
- Eating behaviors
- Depression/mood disorders

Laboratory Values

<table>
<thead>
<tr>
<th>Elevated</th>
<th>Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testosterone</td>
<td>Low</td>
</tr>
<tr>
<td>LH</td>
<td>FSH</td>
</tr>
</tbody>
</table>
| DHEA sulfate | DHEA-
| Cortisol | Cortisol |
| Fasting insulin | Insulin |
| C-reactive protein | CRP |

Medical Treatment

<p>| Hormonal contraceptive | Metformin | Insulin sensitizers |</p>
<table>
<thead>
<tr>
<th>1st line management</th>
<th>2nd line intervention</th>
<th>Recommend against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menstrual abnormalities</td>
<td>T2DM or IGT who fail lifestyle modifications</td>
<td></td>
</tr>
<tr>
<td>Hirsutism</td>
<td>Menstrual irregularities who cannot take HC</td>
<td></td>
</tr>
<tr>
<td>Acne</td>
<td>Not recommended for obesity only</td>
<td></td>
</tr>
<tr>
<td>Inositols</td>
<td>Thiazolidinediones</td>
<td></td>
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</tbody>
</table>

Patient Perspective

“All I knew was that I couldn't lose the weight on my own. I had tried... I mean, I had REALLY tried. And it was impossible. I was hungry all the time, I mean ALL THE TIME. I wasn't losing weight no matter how little I ate, when I was on a diet it took over my life, my thoughts and my whole being. I couldn't do it. And the bigger I got, the more impossible it seemed. And then I felt weak and like a failure... those who know me will tell you that failing is my least favorite thing, I have to be the best at everything and I have to win. Well, I wasn't winning... no matter the effort. And as my failing meant that I was becoming dangerously obese, I had to do something, and this was the reason I came to the realization that surgery was an option I simply had to look into.”

Medical Nutrition Therapy Goals

• Reduce body weight if overweight
• Maintain weight loss after weight reduction
• Obtain knowledge and skills to support behavior changes
• Resolve metabolic syndrome
• Reduce risk factors for T2D and CVD
• Improve fertility

Systematic Review – Dietary Composition in the Treatment of PCOS

• Inclusion – not taking anti-obesity medication
• 6 studies, 137 women
• Results: “Subtle differences between diets”
• Weight loss improved PCOS regardless of dietary composition

Low Glycemic Index

• n=49, parallel nonrandomized controlled
• 12-mo weight loss
• 1571 kcal - 50% CHO, 23% protein, 27% fat
• Dietary counseling weekly to monthly
• 80 min exercise, aim for 10k steps
• Ad libitum intervention
• Compared two diets:
  • Low GI
  • Conventional healthy diet

• Findings of interest
  • Better menstrual regularity (95 vs. 63%)
  • Better insulin sensitivity
  • Lower body fat (2x)
  • Better quality of life

Counseling nugget – No “free-floating” carbohydrates

High Protein

• n=28
• 3-mo weight loss followed by 1-mo weight maintenance
• 1489-1554 calories
• Energy restriction
• Exercise 3x/wk + exercise class
• Monthly counseling
• Compared two diets:
  • High protein – 44/27/28
  • Standard protein – 57/16/27

• Findings of interest
  • Improvements in menstrual regularity independent of diet composition – 44% having improvement
  • Galletly – improvement in depression and self-esteem for high protein

High MUFA vs. ADA Healthy Diet vs. LOW CHO

• n=11, cross-over nonrandomized controlled
• 16 day acute weight maintenance intervention
• 2000 kcal
• Food provision
• Continue with previous exercise
• Compared three diets:
  1. MUFA enriched
  2. Conventional healthy diet modeled after ADA guidelines
  3. Low CHO diet
• Findings of interest
  • Anthropometrics – low CHO showed greater wt loss than MUFA

Low GI

• n=49, parallel nonrandomized controlled
• 12-mo weight loss
• 1571 kcal - 50% CHO, 23% protein, 27% fat
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  • Better quality of life
**CHO Restricted vs. Fat Restricted**

- **n=23**, parallel randomized controlled
- 6-mo weight maintenance
- 1429 calories
- Counselling biweekly to monthly
- Compared two diets:
  - CHO restricted/counting
  - Fat restricted/counting

**Findings of interest**
- Improvements in menstrual regularity independent of diet composition – 57% having improvement
- Improvements in quality of life independent of diet composition

Counseling nugget – How do you feel with the diet changes?

**High Protein**

- **n=28**
- 1-mo wt loss
- 997 calorie energy deficit
- Short term energy restricted intervention
- Weekly dietary counseling
- Compared two diets:
  - High protein – 40/30/30
  - Standard protein – 55/15/30

**Findings of interest:**
- No significant differences
- Reduction in wt, WC, FBS, OGTT insulin, TC, LDL

**Walnuts vs. Almonds**

- 31 PCOS women
- 6 weeks, randomized control
- 31 g fat from walnuts (PUFAs) vs almonds (MUFAs)

**Findings of interest:**
- No change in weight
- Increased insulin response by 26%, decreased HbA1C from 5.7 to 5.5%
- Reduced androgens and LDL

Counseling nugget – Include nuts in our patients’ meal plans

**DASH Diet**

- Randomized-controlled study
- 48 women with PCOS, followed for 8 wks
- Both DASH and controlled – 52% CHO, 18% pro, 30% fat

**Findings of Interest:**
- Reduced insulin
- No change in fasting glucose
- Reduced CRP
- Reduced waist & hip circumference

**Anti-Inflammatory**

- 100 overweight and obese PCOS women x 12 wks
- Reduced calorie (-500 kcal), 5 small meals
  - 50% CHO, 25% pro, 25% fat
  - Fish 2x/wk
  - Legumes
  - LF dairy
  - 5 c green tea daily
  - Limited chicken & red meat

Counseling nugget – Add foods to diet instead of taking away

**High Protein Diet**

- 27 women with PCOS
- 40% vs. 15% calories from protein, same calories

**Findings of interest:**
- Greater weight loss (7.7 vs 3.3 kg) and body fat loss (6.4 vs 2.1 kg)
- No difference in lipids or hormones

Counseling nugget – Protein may assist with satiety

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# Anti-Inflammatory Diet - Results

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<thead>
<tr>
<th>Parameter</th>
<th>Reduction After Following Anti-Inflammatory Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean weight loss</td>
<td>7.2% (6.3 kg)</td>
</tr>
<tr>
<td>Waist circumference</td>
<td>6.6%</td>
</tr>
<tr>
<td>Body fat percent</td>
<td>9.2%</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>8.9%</td>
</tr>
<tr>
<td>Fasting blood glucose</td>
<td>5.15%</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>4.3/2.7 mmHg</td>
</tr>
<tr>
<td>CRP</td>
<td>15%</td>
</tr>
<tr>
<td>SAA</td>
<td>38.25%</td>
</tr>
<tr>
<td>Menstrual cyclicity</td>
<td>63%</td>
</tr>
<tr>
<td>Pregnancy rate</td>
<td>12%</td>
</tr>
</tbody>
</table>

# Conclusions

- Energy restriction independent of dietary composition
- Improvements in weight, insulin resistance, menstrual regularity, waist circumference, etc.
- Possible greater quality of life with low GI/high protein

"Ideal Diet"?
- Higher protein
- Lower GI
- Add green tea
- Fish and lean meats
- Fruits/vegetables
- Meal timing and distribution

# Lifestyle Factors

- Sleep health
- Stress management
- Eating patterns
- Exercise

# The Role of Exercise

- Increases expression of GLUT 4 transporters
- Improves glucose uptake
- Improves insulin action
- Lowers LDL

Counseling nugget - Reframe why they are exercising, non-scale victories

# Types of Exercise

- Weight lifting
  - 2-3 days per week on non-consecutive days
  - Major muscle groups
  - High intensity – 3x6-10
  - Continue to increase in difficulty
  - HIT
  - University of California San Francisco study
  - 30 min vigorous exercise/week decreased woman’s likelihood of developing met syn by 22%
  - 10-20-30 workout
  - The Little Method
  - Tabata

# Supplements

- Fish oil
  - 1-4g/day
- N-acetyl cysteine
  - 1-6.3g/day
- Inositol
  - 5g - 2.4g/d
  - d-5g - 50-100mg/d
  - 40:1 ratio
  - Ovalisal
- B12
- Metformin
- PPIs
- Vitamin D
  - 1000mg/day calcium + 50,000 IU/wk vitamin D

Counseling nugget – Prioritize supplementation
Surgical Intervention

• Hirsutism resolution
• DM resolution
• Menstrual function
• Conception

Counseling nugget – Patient communication

Effective Treatment of PCOS with Roux-en-Y Gastric Bypass (RYGB)

• 24 women with PCOS had RYGB
• Measured – mean EWL, hirsutism (52%), regular menstruation, conception rate after surgery, comorbidities

• Results
• 5 women (previously infertile) who wanted to conceive were able to do so after surgery without the use of clomiphene
• Other – resolution of T2D, decreased number of pts with HTN and hyperlipidemia, improvement of PCOS-associated symptoms

PCOS – Is It an Indication for Bariatric Surgery?

• 3 women with PCOS
• Laparoscopic adjustable gastric band (LAGB)
• Outcomes measured - %EWL, glucose levels, conception rate

• Results
• 1 pt conceived postoperatively
• EWL – 49, 67, 41% at +8 yrs
• Normalized glucose

In Vitro Fertilization after Bariatric Surgery

• 2 females with infertility secondary to PCOS
• RYGB, LAGB
• Outcomes measured – conception and pregnancy

• Results
• Following IVF/ICSI, both women became pregnant and had uncomplicated deliveries

RYGB Ameliorates PCOS and Dramatically Improves Conception Rates: A 9-year Analysis

• 20 with PCOS and infertility had RYGB
• Outcomes measured – pre- and post-surgery conception rate (5/6 who wanted to conceive did not need hormone therapy), weight loss, hirsutism (29%), menstrual dysfunction (82%), comorbidities (T2D – 77.8%)

• Results
• 100% postoperative conception rate in infertile patients with PCOS who desired pregnancy
• Improvement in glycemic control, PCOS-associated symptoms, HTN, depression, GERD, urinary incontinence

Role of Excessive Weight Loss in Treatment of Infertility (Abstract)

• 69 premenopausal married females
• Gastric plication or RYGB
• Results measured – regularity of menstruation and conception rate

• Results
• 71% of women who were previously infertile preoperative became pregnant one year postoperatively
Resolution of Gynecological Issues after Bariatric Surgery (Abstract)

- 156 women
  - 67 had radiological features of PCOS
  - 11 were infertile
  - Laparoscopic sleeve gastrectomy (LSG)

- Outcomes measured — hirsutism, stress urinary incontinence, menstrual dysfunction, infertility

- Results
  - 4 pts conceived (36%)
  - Hirsutism and radiological evidence of PCOS improved in 80%
  - Menstrual dysfunction improved in 100%
  - Urinary incontinence resolved or improved in 42%

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Pregnancy Outcomes & Management

- Fertility knowledge
  - When do they plan to get pregnant?
  - ASMBS recommends waiting 12-18 mo

- Maximize weight loss and optimize fertility
  - Protein intake
  - Fluid intake
  - Quality vitamins
  - Target weight gain — 15#

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Case Study #2

- CV: 42 yo F
  - PMH: PCOS, MS, depression/anxiety
  - Labs: HbA1C 5.6, vit D 15
  - C/o: low energy, inability to exercise due to weakness, difficulty losing weight, shakiness

Counseling nuggets:
1) Focus on sleep health
2) Include protein for satiety, blood sugar management, and muscle mass preservation

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Case Study #3

- LL: 20 yo F, BMI 48
  - PMH: PCOS (no period x 8 yrs), h/o cutting
  - Labs: HbA1C 5.6, vit D 15
  - C/o: hirsutism (waxes weakly), difficulty losing weight

Counseling nuggets:
1) Portion control
2) Eat protein first
3) Exercise — patient driven
...but let me tell you something real: I feel the difference. I feel normal. I have now lost that constant hunger that meant I was either thinking about food, thinking about my weight, thinking about my failing health... or eating and getting on with what I had to do. I am now on the right track to becoming healthy again.

I still have about 45 kg, left to lose, but what a relief to know that I WILL lose them in the next year or two. I have been given the tools to do so.