Bariatric Surgery: Successes and Pitfalls

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Columbus, OH

Objectives

- Review the short term and long term successes of bariatric surgery
- Discuss the short term and long term complications of bariatric surgery
- Describe the necessary medical follow-up, monitoring and treatment plans for patients that have undergone bariatric surgery
- Recognize the need for comprehensive weight management before and after surgery has occurred.

It is predicted that over the course of the next 20 years obesity will be the number one health problem throughout the world.
A Life-Threatening Disease

- Most studies show an increase in mortality rate associated with obesity (BMI > 30).
- Obese individuals have a 50% to 100% increased risk of death.
- When BMI > 45
  - White men could lose up to 13 years of life.
  - White women up to 8 years of life.
  - African American men up to 20 years of life.
  - African American women up to 5 years of life.

Relative Risks with BMI>40

<table>
<thead>
<tr>
<th>Co-morbidities</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast CA</td>
<td>1.70</td>
<td></td>
</tr>
<tr>
<td>Colon CA</td>
<td>1.84</td>
<td>1.36</td>
</tr>
<tr>
<td>Kidney CA</td>
<td>1.70</td>
<td>1.70</td>
</tr>
<tr>
<td>Liver CA</td>
<td>4.52</td>
<td>1.68</td>
</tr>
</tbody>
</table>

Relative Risks with BMI>40

<table>
<thead>
<tr>
<th>Co-morbidities</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 2 DM</td>
<td>10.65</td>
<td>19.89</td>
</tr>
<tr>
<td>CAD</td>
<td>13.97</td>
<td>19.22</td>
</tr>
<tr>
<td>HTN</td>
<td>64.53</td>
<td>63.16</td>
</tr>
<tr>
<td>OSA</td>
<td>10.04</td>
<td>17.19</td>
</tr>
</tbody>
</table>

Bariatric Surgery Becomes “Legitimate”

- 1991 NIH Consensus Developmental Conference
  - Medical weight loss unacceptably high incidence of weight regain after 2 years.
  - Two treatments recommended as effective long term:
    - Roux-en-Y Gastric Bypass
    - Vertical Banded Gastroplasty
**Popularity of Bariatric Surgery**

- NIH- 1991
- Laparoscopy-1993
- Carnie Wilson
- Al Roker
- ‘Patient Driven’
- $$$$$$

**Bariatric Surgery Volume in U.S.**

![Graph showing the increase in bariatric surgery volume from 1993 to 2005.]

- **16,800 operations in 1993 to 178,000 operations in 2005**

**Statistics on Weight Loss Surgery**

- The number of gastric bypass surgeries climbed more than 600% from 1993 to 2003.
- The average bariatric surgery patient is a woman in her late 30s who weighs approximately 300 pounds.
- The average cost of the surgery is $30,000

**Statistics on Bariatric Surgeons**

- The number of active surgeons in the American Society for Bariatric Surgery jumped nearly 500 percent, from 168 in 1993 to 860 in 2003.
### The OSU Team
- Surgeons
- Dietitians
- Psychologists
- PCRM’s and Nurse Practitioner
- Exercise Physiologists
- Medical Specialties

### Operations Performed in the U.S.
- Restrictive (86%)
  - RYGBP (70%)
  - Lap-Band/VBG (16%)
- Malabsorptive (12%)
  - BPD
  - Duodenal switch

### Getting Patients to Surgery
- Information Session and Application
- Medical, Dietary and Psychological Evaluations and Labs/Testing
- Determination of Candidacy and Pre-Operative Requirements
  - 4 weeks, 12 weeks, 6 months, 1 year
  - Education and behavioral modification

### Bariatric Surgery at The OSU
- 1976-Mason procedure
- July 1977- 1st gastric stapling procedure
- 1979-Pace (single row TA-55)
- 1982-Carey (silastic collar gastroplasty)
- 1982-Martin (double row, liquid diet)
**Bariatric Surgery at The OSU**

- 1994 - Open Gastric Bypass (TA-90B)
- October 2000 - Laparoscopic Gastric Bypass
- February 2001 - Lap Band (FDA C-trial)
- April 2007 - First U.S. Stomaphyx™

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**The Lap-Band**

**The Roux-en-Y Gastric Bypass**

- 15 - 30 cc pouch
- 12 - 14 mm stoma
- 75 - 150 cm Roux limb

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**Postoperative Management**

- Prevention of Cardiopulmonary Complications
  - Sleep apnea, obesity hypoventilation syndrome
- DVT/PE prophylaxis (<2%)
Postoperative Management

- Monitoring for Surgical Complications
  - Leaks (1%), Bleeding (2%), Dehiscence (Open)
- Antibiotics and Wound Care
- Ambulation and prevention of pressure injuries
  - Rhabdomyolysis

Impact of Volume on Outcomes

- Morbidity
  - 28.0%, surgeons <10 cases/yr
  - 14.0%, surgeons high volume/yr (p<0.05)
- Low volume hospitals 2.7 X increased risk of complications versus high volume hospitals

Impact of Volume on Outcomes

- Surgeon volume for M&M in 4,685 cases in Pa
  - Courcoulas et al, Surgery, 134:613-621
  - Mortality
    - 5.0%, surgeons <10 cases/yr
    - 0.3% surgeons high volume/yr, (100 cases, p=0.06)

Laparoscopic Gastric Bypass

<table>
<thead>
<tr>
<th>Surgeon</th>
<th>N</th>
<th>OR Time</th>
<th>LOS</th>
<th>Follow-up</th>
<th>Weight Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wittgrove</td>
<td>500</td>
<td>120 min</td>
<td>2.6</td>
<td>60</td>
<td>73% EWL</td>
</tr>
<tr>
<td>Higa</td>
<td>400</td>
<td>-</td>
<td>1.6</td>
<td>22</td>
<td>69% EWL</td>
</tr>
<tr>
<td>Schauer</td>
<td>275</td>
<td>247 min</td>
<td>2.6</td>
<td>30</td>
<td>77% EWL</td>
</tr>
</tbody>
</table>
### Open Gastric Bypass Series

<table>
<thead>
<tr>
<th>Name</th>
<th>n</th>
<th>Leak</th>
<th>Hernia</th>
<th>Followup</th>
<th>Weight Loss</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugerman</td>
<td>182</td>
<td>1.6%</td>
<td>18%</td>
<td>12 mo</td>
<td>67% EWL</td>
<td>1%</td>
</tr>
<tr>
<td>Poires</td>
<td>608</td>
<td>-</td>
<td>23.9%</td>
<td>168 mo</td>
<td>49% EWL</td>
<td>1.5%</td>
</tr>
<tr>
<td>Capella</td>
<td>560</td>
<td>0</td>
<td>-</td>
<td>60 mo</td>
<td>62% EWL</td>
<td>0</td>
</tr>
<tr>
<td>Fobi</td>
<td>944</td>
<td>3.1%</td>
<td>4.7%</td>
<td>24 mo</td>
<td>80% EWL</td>
<td>0.4%</td>
</tr>
<tr>
<td>Maclean</td>
<td>243</td>
<td>-</td>
<td>16%</td>
<td>66 mo</td>
<td>BMI 44-29</td>
<td>0.41%</td>
</tr>
</tbody>
</table>

### Long-Term Concerns
- **Strictures**
- **Marginal Ulcers**
- **Protein deficiencies**
- **Vitamin and Mineral deficiencies**
- **Hernias**
  - port site and internal hernias/sbo
- **Cholelithiasis**
- **Hypoglycemia**
- **Kidney stones**
- **Eating disorders**
- **Addiction**
- **Maintenance of weight loss**

### Weight Loss Curves

![Weight Loss Curves](link)

*Schauer et. al.*

### Pouch Complications
- **Strictures**
  - 5-20% and occurs b/w 3-8 weeks
  - Treated with EGD and dilatation
### Pouch Complications

- **Marginal Ulcer**
  - 2-5% and can occur at any time
  - NSAIDS, Smoking, Steroids, Stress
  - Treat with PPI’s, sucralfate
  - R/o Gastrogastric fistula
  - Possible revision and vagotomy

### Small Bowel Complications

- **Internal Hernias**
  - 3.3% incidence
  - 2/3 Petersen’s hernia
  - 1/3 Mesenteric defect at Jejunojejunostomy
  - CT scan and UGI/SBFT neg. in >25%
  - May be emergency due to ischemia

### Small Bowel Complications

- **Incisional Hernias**
  - 15-20% in open cases, 1-2% in laparoscopy

### Stones

- **Cholelithiasis**
  - Prophylactic vs. selective cholecystectomy
  - 30% incidence of stones, 9% cholecystectomy
  - Decreases to ~1% w/ 6 months tx ursodiol
**Stones**

<table>
<thead>
<tr>
<th>Stones</th>
<th>Definitions of Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Kidney stones</td>
<td>• Weight loss</td>
</tr>
<tr>
<td>✓ &gt; 12 months post op</td>
<td>✓ &gt;50% EBWL</td>
</tr>
<tr>
<td>✓ Increased serum oxalate-a and decreased urine citrate</td>
<td>• Resolution of Co-morbidities</td>
</tr>
<tr>
<td></td>
<td>✓ Diabetes, HTN, Sleep Apnea, Joint pains, Dyslipidemias, Venous Stasis, GERD</td>
</tr>
</tbody>
</table>

**Psychiatry**

<table>
<thead>
<tr>
<th>Psychiatry</th>
<th>Weight Regain-Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Coping/Depression/Divorce</td>
<td>• Weight regain at 10 years post-op</td>
</tr>
<tr>
<td>• Eating disorders</td>
<td>✓ There was a significant ($P &lt; 0.0001$) increase in BMI in both morbidly obese (BMI &lt; 50 kg/m²) and super obese patients (BMI &gt; 50 kg/m²) from the nadir to 5 years and from 5 to 10 years.</td>
</tr>
<tr>
<td>✓ Anorexia</td>
<td></td>
</tr>
<tr>
<td>✓ Bulemia</td>
<td></td>
</tr>
<tr>
<td>• Addiction</td>
<td></td>
</tr>
<tr>
<td>✓ Alcohol</td>
<td></td>
</tr>
<tr>
<td>✓ Sex</td>
<td></td>
</tr>
</tbody>
</table>

### Weight Regain-Failure

- There was a significant increase in failures and decrease in excellent results at 10 years when compared with 5 years.
- The failure rate when all patients are followed for at least 10 years was 20.4% for morbidly obese patients and 34.9% for super obese patients.


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### Novel Techniques in the Treatment of Obesity

### Revision Surgery?

- No data to determine who “best” and “worst” candidates for revisions
- Higher risk than original operation
- Limited data on successes after revision
- Convert to gastric bypass
- Revise pouch and anastomosis
- Covert to “long-limb” bypass
- “Band” the bypass

### Bridge Operations-Sleeve Gastrectomy

- Can be performed as bridge to Gastric Bypass, Duodenal Switch or Lap Band
- Can be its own weight loss operation
- ~57% EBWL @ 3 yrs

© 2005 Dallas / Schauer
BioEnterics Intragastric Balloon (BIB):

Endolumenal Sleeves


Endoscopic Restrictive Gastroplasty
Dr. Ram Chuttani

- ndo Plicator
- ePTFE pledgets and pre tied suture
- 4 pleats are formed
- Pleats are then joined to form ring

Considerations Before and After Surgery: Medical Sequelae of Obesity

- Hypertension
- Lipid disorders
- Diabetes
- Ischaemic heart disease
- Cardiomyopathy
- Pulmonary hypertension
Considerations Before and After Surgery: Medical Sequelae of Obesity

- Asthma
- Obstructive sleep apnea
- Gallstones
- NASH (Non-alcoholic steatohepatitis)
- Urinary incontinence

Considerations Before and After Surgery: Medical Sequelae of Obesity

- Immobility
- Breast/bowel/prostate/endometrial cancer
- Venous stasis ulcers
- Intertrigo
- Accident prone

Considerations Before and After Surgery: Medical Sequelae of Obesity

- GERD
- Arthritis/back pain
- Infertility/menstrual problems
- Obstetric complications
- DVT and thromboembolism
- Depression

Co-Morbidities in Bariatric Patients The OSU Experience

![Graph showing adults and children's percentages for OSA, DM, and HTN](image)
What Are The Medical Issues After Bariatric Surgery?

Resolution of Co-Morbidities Type 2 Diabetes Mellitus

• Gastric Banding
  ✓ Resolution of DM at 2 years 72%
  ✓ At 10 years, 36%


Ability to Maintain Weight Loss

Resolution of Co-Morbidities Type 2 Diabetes Mellitus

• Gastric By-pass
  ✓ Resolution of DM 76.8, 83, 86%
  ✓ At 14 years, 83% remained resolved
  ✓ At 14 years, IGT 99% remained glucose tolerant

Resolution of Co-Morbidities

**Hypertension**

- All forms of weight loss results in reduction in BP
- *Resolution 62% with significant improvement 78.8%*
- **In DM subset, 69% had resolution at 1yr., 66% at 7yr.**
- Gastric by-pass is more effective than vertical banding

**Dyslipidemia**

- Swedish Obesity Study
  - 2 and 10 yrs, significant improvement in HDL and triglycerides
  - Total cholesterol was not changed

**Dyslipidemia**

- Significant improvement in lipids in 70%
  - Gastric by-pass better than vertical bands
  - HDL improve significantly with vertical bands

**OSA, NASH, Pseudotumor Cerebri**

- NASH – decrease in severity
- OSA - 85.7-93% resolution
- Pseudotumor Cerebri – success rates are higher than results of shunt placement

No long term studies examining recurrence
Obesity Surgery and Reduction in Long-Term Mortality

- Flum & Dellinger – surgical pts. had a 59% greater chance at 5yr survival than nonsurg obese pts.
- Christou, et al. reported mortality rate of 0.67% vs. 6.17% in surg vs. nonsurg.
- MacDonald, et al. 6-9yr mortality 1% vs. 4.5% in surg vs. nonsurg.

Nutritional & Metabolic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>VBG</th>
<th>RYGB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Malnutrition</td>
<td>Rare</td>
<td>Less common (4.7%)</td>
</tr>
<tr>
<td>Fat Malabsorption</td>
<td>None</td>
<td>Less common</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>None</td>
<td>Common (30%) 1-9</td>
</tr>
<tr>
<td>Iron deficiency</td>
<td>Rare</td>
<td>Common (20-49%)</td>
</tr>
<tr>
<td>Folate deficiency</td>
<td>None</td>
<td>Less common</td>
</tr>
<tr>
<td>Thiamine deficiency</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Fat-soluble vitamins</td>
<td>None</td>
<td>Less common (65%) 4</td>
</tr>
<tr>
<td>Calcium deficiency</td>
<td>Rare</td>
<td>Less common</td>
</tr>
<tr>
<td>Bone disease</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Cholelithiasis</td>
<td>Less common</td>
<td>Common</td>
</tr>
</tbody>
</table>


Long-term, Non-Surgical Complications of Weight Loss Surgery

- Macronutrient deficiencies
- Micronutrient deficiencies
- Hypoglycemia
- Metabolic bone disease
- Psychological disease

Why Deficiencies in Micro- and Macronutrients Occur

Shah, et al., J Clin Endocrinol Metab 91:4223-4231, 2006
Pre-operative Evaluation

- Complete blood count
- Chem 10
- Albumin/pre-albumin
- B₁₂, folate
- PT/PTT
- Fat soluble vitamins
- Uric Acid

Prophylactic Nutritional Supplementation

<table>
<thead>
<tr>
<th>Supplement</th>
<th>VBG</th>
<th>RYGB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multivitamin with minerals</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vitamin B₁₂ (350-500µg/d)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Calcium elemental (1200-1500)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Ferrous Sulfate (325-650mg/d)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Protein (40-100mg/d)</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Post-operative RYGB* and Vertical Banding Follow up Recommendations

- ✓ Lifelong monitoring
- ✓ Tests performed 3-6month intervals for first 2 years
- ✓ Yearly thereafter

- Complete blood count
- Chem 10
- Albumin/pre-albumin
- B₁₂, folate
- PT/PTT
- Fat soluble vitamins†
- Uric Acid
- PTH

Hypoglycemia

- Rare occurrence
- Etiology unknown
- Hyperinsulinemic hypoglycemia
  - ✓ Adaptive beta cell hypertrophy due to the obese insulin resistant state
  - ✓ Nesidioblastosis after surgery
### Metabolic Bone Disease

- Multifactorial – related to calcium deficiency, vitamin D deficiency and weight loss itself
- At 10yrs. post RYGB, increased alkphos, low Ca, low vit D.
- At 4yrs., hypocalcemia increased from 15 to 48%
- As early as 3-9mon, patients have demonstrated increased bone markers

### Psychological Assessments for Weight Loss Surgery Candidates

- Axis I Disorders – rates of occurrence 27.3-41.8%
- Axis II Disorders – rates of occurrence 22-24%

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### Prevention of Bone Disease

- Supplementation is recommended for all RYGB patients
- 1200-1500mg elemental calcium
- Calcium citrate plus vitamin D preferred
- Consider DEXA scan if evidence of calcium deficiency

### Psychological Disorders After Weight Loss Surgery

- Does mental health improve?
  - Balsiger, et.al. 2000 93% followed for 3yrs. reported improvement
  - Maddi, et.al. 2001 improvement in MMPI-2
  - Waters, et.al. 1991 found improvement in psychological fx, but lack of difference by 3 yrs.

**Psychological Disorders After Weight Loss Surgery**

- No standards exist
- Severity rather than nature of symptoms was predictive of success

**Scientific Questions**

- What is the abnormality in the hormonal milieu that sets up the vicious cycle of weight gain and regain?
- What is the role of the adipocyte in the inflammatory-related co-morbidities?
- What is the role of gut hormones in obesity and how does weight loss surgery impact this?

**What We Don’t Know About Weight Loss Surgery**

- How to define success?
- What is the best age for surgery?
- What is the correction procedure for a given patient scenario?
- Patient selection – need for revisional surgery
- What is the best titration plan for medications?

**Obesity Rates by County in Ohio**

- Ohio has 10th highest level of adult obesity (24.9%)
- Ohio has the 4th highest overweight high school student pop.(13.9%)
- Ohio has the 33rd highest overweight level for low income children ages 2-5 (11%)
### A Proposal for a Multidisciplinary Approach at The OSU

- The Ohio State University should play a significant leadership role in obesity research, obesity management and community and national outreach.
- We have all the resources/expertise at The Ohio State University to achieve these goals and to be a leader in solving the problems of obesity.
- There is need for growth in research, patient care and collaboration within The Comprehensive Weight Management Center.

### Comprehensive Weight Management Center Objectives

- To achieve independent funding for research
- To achieve National Recognition for research in obesity.
  - Basic Research endeavors
  - Clinical Research endeavors

### Comprehensive Weight Management Center Objectives

- To provide superior patient care
  - Early intervention
  - Chronic management of obesity
  - Short- and long-term follow up of post weight loss surgery patients