Bariatric Surgery for the Treatment of Diabetes

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Minimally Invasive Surgery Fellowship
University of Louisville
July 2003 – July 2004
Board Certified by the American College of Surgeons
Associate of Rio Grande Surgeons, PA
Bariatric Accreditations

- HealthGrades 5 Star Recipient for Bariatric Surgery
- American College of Surgeons – Center of Excellence
- ASMBS – Center of Excellence
- BCBS – Blue Distinction
- AETNA – Institutes of Quality
- OptumHealth – Center of Excellence Network
- CIGNA – Certified Hospital for Bariatric Surgery
Experience and Procedures Offered

- **Experience**
  - Del Sol Medical Center, Dr. Acosta and Dr. Lara have participated in over 2,300 bariatric cases since 2004.

- **Surgical Procedures**
  - Roux-en-Y Gastric Bypass
  - Sleeve Gastrectomy
  - Adjustable Gastric Band
OBESITY

- ASMBS reports that >60 million U.S. adults or > 20% of the U.S. population are obese
- 50% of the U.S. population is overweight
- Greater than 13 million Americans are morbidly obese
- Most studies show a nearly 100% failure rate during a 5 yr. period for persons who diet. In contrast 75% of pts. who undergo LRNYGB are able to keep off at least 50% of their excess wt. for 10 yrs. or longer. (MacLean LD. Ann Surg. 2000;231)
COST OF OBESITY

- 2008 - $47 Billion of total medical costs were for treating obesity and obesity related co-morbid conditions

- 10% of U.S. annual medical costs are due to obesity

- 80% greater prescription drug costs for obese pts. when compared to normal weight individuals
Obesity is Associated with Higher Mortality Rates

Complications from obesity result in approximately 300,000 deaths per year in the U.S.
Calle et al, N Eng J Med, 1999; (15)341:1097-105
Morbidity and Mortality

Most of the morbidity and mortality stems from obesity related co-morbid conditions

(Statistics related to Overweight & Obesity NIDDK of the National Institutes of Health)
Medical Complications of Obesity

- **Diabetes type 2**
- **Hypertension**
- **Sleep Apnea**
- Lipid disorders
- Heart disease
- Asthma
- Gallstones
- NASH (non-alcoholic steatohepatitis)
- Urinary incontinence
- Gastroesophageal reflux
- Osteoarthritis

- Infertility and menstrual problems
- Hip, knee, ankle and low back pain
- DVT & thromboembolism
- Psychosocial impairments
- Immobility
- Cancer (breast, colorectal, prostate, endometrial, etc.)
- Venous/stasis ulcers
- Skin infections
- Accident proneness
BODY MASS INDEX (BMI)

- BMI = \frac{\text{weight (kg)}}{\text{height (m)} \times \text{height (m)}}

- Web site to calculate BMI: www.obesityhelp.com
National Institutes of Health

BMI 35-40

*with significant co-morbid conditions*

(DM 2, HTN and or OSA)

BMI > 40
Degrees of Obesity

BMI 18.5 – 24
OVERWEIGHT

BMI 30 – 34.9
OBESE

BMI 35 – 39.9
SEVERE OBESE

BMI ≥ 40
MORBIDLY OBESE
What is Bariatric Surgery Today?

Three Types of Most Commonly Performed Bariatric Surgery Procedures

Malabsorptive
- Biliopancreatic Diversion w/ Duodenal Switch

Restrictive
- Adjustable Band Gastroplasty

Combination
- Roux en Y Gastric Bypass
Laparoscopic vs. Open Surgery

- **Laparoscopic Surgery**
  - Surgeon uses long instruments to handle organs via monitor
  - Smaller incisions
  - Improved cosmesis
  - Less pain
  - Quicker time to ambulation
  - Decreased pulmonary complications
  - Faster recovery

- **Open Surgery**
  - Surgeon handles the organs
  - Traditional
  - Larger incision
Roux-en-Y

Gastric Pouch

Gastrojejunostomy

Excluded Stomach

Roux Limb

Jejejuno-jejunostomy
Roux-en-y Gastric Bypass Animation
## Bypass Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>National Rates</th>
<th>Acosta/Lara</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak</td>
<td>6%</td>
<td>0.4%</td>
</tr>
<tr>
<td>DVT/PE</td>
<td>11%</td>
<td>0.5%</td>
</tr>
<tr>
<td>G-J stricture</td>
<td>20%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Bowel Obstruction</td>
<td>14%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Internal Hernia</td>
<td>5%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Stoma Ulcer</td>
<td>16%</td>
<td>0%</td>
</tr>
<tr>
<td>Cholelithiasis</td>
<td>38%</td>
<td>5%</td>
</tr>
<tr>
<td>Mortality</td>
<td>&lt;1%</td>
<td>0.13%</td>
</tr>
</tbody>
</table>
Dumping Syndrome

- Caused by consumption of concentrated sweets

- Symptoms include: painful cramping, nausea, diarrhea, diaphoresis

- A “desirable side effect” associated with the RNYGB
**Ghrelin**

Hormone produced by P/D1 cells in stomach (fundus), pancreas, and hypothalamus. This “Hunger Hormone” mimics growth hormone, thus increasing food intake and increasing fat mass.

1 study has found that RNYGB can decrease Ghrelin levels (2002/NEJM 346(21) p. 1623-30) “Plasma Ghrelin levels after diet-induced weight loss or gastric bypass surgery”. Cumming D. Weigle D, Frayo R, Breen P.

Research on anti-obesity vaccine, directed Ghrelin using specific antibodies thus preventing Ghrelin from reaching the CNS.
Gastric Bypass Follow-Up

- 2 weeks
- 3 months
- 6 months
- 12 months
- 18 months
- Annually thereafter
VERTICAL SLEEVE GASTRECTOMY
VERTICAL SLEEVE GASTRECTOMY
ADJUSTABLE GASTRIC BAND
ADJUSTABLE GASTRIC BAND
<table>
<thead>
<tr>
<th>Complication</th>
<th>National Rates</th>
<th>Acosta/Lara</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port infection</td>
<td>9%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Band Erosion</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>Band slip/prolapse</td>
<td>24%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Port malfunction</td>
<td>7%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Mortality</td>
<td>0.2%</td>
<td>0%</td>
</tr>
</tbody>
</table>
# Procedure Comparison

<table>
<thead>
<tr>
<th>Gastric Bypass</th>
<th>Sleeve</th>
<th>Gastric Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-80% wt loss</td>
<td>70% wt loss</td>
<td>40-50% wt loss</td>
</tr>
<tr>
<td>(12-18 months)</td>
<td>(12-18 months)</td>
<td>(24-36 months)</td>
</tr>
<tr>
<td>2 night stay</td>
<td>1 night stay</td>
<td>1 night stay</td>
</tr>
<tr>
<td>Short recovery time</td>
<td>Short recovery time</td>
<td>Shorter recovery time</td>
</tr>
<tr>
<td>Most foods are tolerated</td>
<td>No foreign body</td>
<td>Some foods not tolerated</td>
</tr>
<tr>
<td>Possibility of Malnutrition</td>
<td>No Dumping syndrome</td>
<td>Low risk vitamin deficiency</td>
</tr>
<tr>
<td>Difficult to reverse</td>
<td>No Intestinal bypass</td>
<td>Easily reversible</td>
</tr>
<tr>
<td>Longer proven track record</td>
<td></td>
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</table>
OSTEOARTHRITIS

- Obese adults are 4 times more likely to develop OA of the knee than non-obese individuals.
- 69% of pts. who have received a doctor’s diagnosis of arthritis are overweight.
- Risks for knee OA increase by 36% for every 2 units of BMI (5kg) of weight gain. (*March & Bagga; Med Jnl 2004;180-S6-S10*)
- 59% of Bariatric pts. reduce or discontinue use of arthritis medications one yr. after Bariatric surgery. (*Ahorni JH; Obes Surg. 2005;15(5);(641-7.*)
- 89% of patients report complete relief of pain caused by OA in at least one joint after Bariatric surgery. (*Lementowski PW & Zelief SB. Am J Orthop. 2008;37(3);148-151*)
Obstructive Sleep Apnea

- Two times more prevalent in obese adults
- Obese pts. represent >70% of patients with OSA
- Resolution in 86% of Bariatric patients (n-1195) in a recent meta-analysis study

(Bariatic Surgery; A Systematic Review & meta-Analysis; Buchwald H. JAMA 2004;292(14);1724-1737)
Hypertension

“When indicated, surgical intervention leads to significant improvements in decreasing excess weight and comorbidities that can be maintained over time.”

American Heart Association, 2011

*(scientific statement Circulation 2011;123)*
HTN is six times more likely in obese pts.

Each 10kg/22lbs increase in weight = 3mm Hg higher systolic blood pressure and 2mm Hg higher diastolic pressure translating to a 12% higher risk of CAD.

HYPERTENSION

- 62% resolution of HTN after Bariatric surgery associated weight loss

- 78% improvement in patients who don’t achieve normalization but may nevertheless be able to reduce HTN medications

Cardiovascular Risk

- Bariatric Surgery reduces risk of major cardiovascular events
  
  *(Scott JD, et al. Journal of obesity related diseases)*

- Bariatric Surgery was associated with a 25-50% risk reduction in the composite index of post op myocardial infarction, stroke and death

  *(Large retrospective cohort study)*
**LIPID DISORDERS**

- Reduction of high cholesterol in 71% of bariatric surgery patients.

- 28% increase in HDL Cholesterol with LRNYGB/LSG in the first year after Bariatric surgery
Amelioration of Diabetes Mellitus Following Gastric Resection

By

L. Angervall, G. Dotevall and H. Tellander

It is of theoretical and practical interest to study the course of diabetes before and after gastric resection. This operation is rarely performed on diabetics, partly due perhaps to the fact that the latter show a relatively low incidence of peptic ulcer (Tillander 1957; Dotevall 1959).

Friedmann et al. (1953) reported three cases of diabetes mellitus in which peptic ulcer supervened and subtotal gastrectomy was performed. In each case the operation was followed by a marked insulinae system of the liver. The results of other investigations suggest that the substance obtained from gastric mucosa is an adrenaline derivative, though the fact that, like glucagon, it cannot be blocked by ergotamine would seem to indicate otherwise (Vuyksteke & de Duve 1959).

Cells whose function is properties resemble those of alpha cells in the islets of Langerhans have been observed in the gastric mucosa (cf. Fermer 1952). It has
“Who Would Have Thought It?”
Diabetes study by Pories, et al

- Gastric Bypass in 330 patients with NIDDM
- Pre-op weight average 304 lbs, 1 year post-op average 198 lbs
- Normal levels of glucose, insulin, glycosylated hemoglobin in 91% of patients for as long as 14 years

*Annals of Surgery Vol. 222, No 3, 339-352, 1995*
Bariatric Surgery: A systematic Review and meta Analysis *(Buchwald et al. JAMA 2004)*

- All articles on bariatric surgery between 1990 and 2003
- 139 studies for a total of 22,094 patients
- DM resolved in 76.8% and improved in 86%
American Diabetes Association, 2009 statement: “Bariatric surgery should be considered for adults with BMI>35 and type 2 diabetes, especially if the diabetes is difficult to control with lifestyle and pharmacologic therapy.”
STAMPEDE (Surgical Treatment and Medications Potentially Eradicate Diabetes Efficiently).

A randomized, controlled single-center (Cleveland Clinic) study involving 150 pts.

(NEJM. March 26, 2012 Schauer et al.)
STAMPEDE

Primary endpoint-Hg A1C of 6.0% or less @ 1 yr was achieved in:

- 42% pts. In LRNYGB on no diabetes meds
- 37% pts. In Lap Sleeve Gastrectomy
- 12% pts. assigned to intensive medical management based upon ADA guidelines including a Wt. Loss program

At enrollment average Hg A1C was 9.2%, multiple DM meds and 50% were on insulin

F/U of STAMPEDE pts. will continue through 4 yrs.
Bariatric Surgery vs. conventional Med TX for DM 2

(Migrone et al. N. Engl J. Med. 2012 arch 26)

- Bariatric Surgery (gastric bypass and BPD) more effective than conventional Tx in controlling T 2 DM
- Randomized single center trial
- End pt. remission defined as BS<100, HgA1C <6.5%
- No diabetes remission in Med Therapy
- 75% had Diabetes remission in GBP group
- 95% had Diabetes remission in BPD group
- Surgical groups had greater wt. loss
# Remission of Type 2 DM After Surgery

<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th>Percent Remission</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>RYGB</td>
</tr>
<tr>
<td>Gan et al. 2007</td>
<td>Prospective</td>
<td>69</td>
</tr>
<tr>
<td>Lee et al. 2011</td>
<td>Randomized Single Blind</td>
<td>93</td>
</tr>
<tr>
<td>Vidal et al. 2007</td>
<td>Prospective</td>
<td>62</td>
</tr>
<tr>
<td>Benaises et al. 2011</td>
<td>Prospective</td>
<td>92</td>
</tr>
<tr>
<td>Nocca et al. 2011</td>
<td>Prospective</td>
<td>66</td>
</tr>
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Foregut Theory

Pournaras et al. *Surgery for Obesity Related Diseases* 2012

Oral vs gastrostomy glucose loading

**RESULTS**

Exclusion of distal stomach, duodenum and proximal jejunum leads to enhanced insulin secretion and satiety gut hormone response after glucose loading.

**WEIGHT LOSS INDEPENDENT EFFECT OF T2 DM RESOLUTION**
REACTIVE HYPOGLYCEMIA

- Late complications of gastric bypass with abnormally elevated Insulin levels post prandially
- Due to the rapid digestion and absorption of ingested carbohydrates with unregulated secretion of insulin by Beta Cells
- Treatment:
  - Dietary Modification (low carb)
  - Pharmacotherapy (Acarbose)
  - Partial Pancreatectomy
THE FUTURE

- Pharmacotherapy (the magic pill)
  Lorcanerin (Belviq),
  Phenteramine/extended release Topiramate (Qsymia)

- New surgical procedures:
  Duodenal Sleeve, intragastric balloon

- Changing BMI parameters to cover patients
  BMI 30-35
GBP for BMI 30-35

- Brazil (observational retrospective)

- Difficult to control T2 DM and class 1 obesity

- 100% improvement in glycemic control and 48% resolution of T2 DM
FAQ

- Excess skin
- Vitamins
- Home medications
- Pregnancy
PROCESS

- PCP referral
- Attend educational seminar
- Initial Consultation
- Psychological Evaluation
- Letter of Medical Necessity to Insurance
- Medical Clearances – from Primary Care Doctor
- Schedule for Surgery
MULTIDISCIPLINARY TEAM

- Jorge Acosta, M.D. Co-Medical Director
- Michael D. Lara, M.D. Co-Medical Director
- Denise Porter RN, MBA, NEA-BC Administrative Director
- Sandra Mendoza, RN, CBN, BSN Clinical Coordinator
- Deborah Aguilar, RN, CBN Clinical Coordinator
- Blanka Chavez, RD, LD, Dietitian Coordinator
- Rebecca Arellano, Operations Manager
- Lupe Montoya, Program Assistant
- Sandra Randon, Program Assistant
- Javier Carrillo, Ph.D. Psychologist