BARIATRIC SURGERY

When and Why

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"There is no reliable method of treatment to produce significant sustained weight loss in obese individuals." NEJM, 1995.

Morbid Obesity

- Body Mass Index (BMI) of 35 or higher
  - Approx. 100 pounds overweight
  - Lean BMI: 21-25
  - "overweight": 26-30
  - Obese: 30-35

Morbid Obesity

- In the USA
  - 68% overweight
  - 33% obese
  - 12% morbidly obese (37 million)

Comorbidities Associated with Severe Obesity

- Life Threatening
  - 1/3 Type II Diabetes
  - 1/2 hypertension
  - Obstructive sleep apnea
  - Pulmonary hypertension
  - Heart failure
  - Pseudotumor cerebri

Comorbidities

- Life Limiting
  - Degenerative joint disease
  - Cholelithiasis/cholecystitis
  - Venous stasis disease
  - Dysmenorrhea/infertility
  - Polycystic Ovary Syndrome (PCOS)
  - Non Alcoholic Liver Disease
  - Panniculitis/cellulitis
  - Renal dysfunction/proteinuria
  - Psychological disease

Pathophysiology of Obesity

- Type II Diabetes
  - Increased intraabdominal adipose tissue (metabolically active) leads to increased glucose and hyperinsulinemia
  - Increased insulin resistance
  - Downregulation of insulin receptors
  - Derangement of the hormonal “gut-brain axis”

Pathophysiology

- Hypertension
  - Increased insulin leads to increased sodium reabsorbtion
  - Increased intraabdominal pressure leads to increased renal vein pressure and renal capsular pressure
    - Stimulation of the renin-angiotensin axis

Pathophysiology

- Cardiac
  - Hypertension leads to concentric LVH
  - Hypercholesterolemia (low LDL) leads to accelerated atherosclerosis
  - OSA leads to increased dysrhythmias, sudden death

Pathophysiology

- Obesity Hypoventilation Syndrome (OHS)
  - ↑ intraabdominal pressure→upward pressure on diaphragm→pulmonary restriction and alveolar collapse
  - ↑arterio-venous shunting
  - ↑inferior vena cava pressures→increased risk for DVT, PE
  - Hypoxemia and hypercarbia while awake

Pathophysiology

- Obstructive Sleep Apnea Syndrome (OSA)
  - Large, heavy tongue and fatty hypopharynx
  - Sleep polysomnography
    - Respiratory Disturbance Index (RDI)
      - Apneic + hypopneic episodes
      - RDI 20-39 "moderate"
      - RDI >40 "severe"
  - Treatment
    - Weight loss
    - CPAP/BIPAP
    - UPPP, tracheostomy

Pathophysiology

- Female Hormonal Dysfunction/Pregnancy
  - ↑ levels of virilizing hormone androstenedione
    - Infertility, masculinizing features
  - Polycystic Ovary Syndrome (PCOS)
  - ↑complications of pregnancy such as pre-eclampsia

Pathophysiology

- Malignancy
  - Uterine
  - Breast
  - Prostate
  - Kidney
  - Colon
  - Gallbladder
  - esophageal

Beneficial Effects of Surgical Weight Loss

- Type II Diabetes
- Hypertension
- OSA
- Hormonal Dysfunction
- Cardiovascular
- mortality

Type II Diabetes

- Pories '95, '97
  - First to report significant improvement in glucose intolerance in GBP population.
- Schauer '03
  - 240 patients with impaired fasting glucose or frank Type II DM
  - 1-5 year follow-up
  - Fasting BG, HgA1c returned to normal in 83%, significantly improved in 17%.
- Annals Surg 2003

Hypertension

- Foley 1992
  - 289 patients, mean follow-up 4.2 years
  - 66% resolution of hypertension
- Brolin 1994
  - 70% resolution over mean follow-up of 39 months

Obstructive Sleep Apnea

- Valencia, et al. (Obesity Surgery 2004)
  - Surgical weight loss eliminated OSA in 46% of a group with severe disease
- Rasheid, et al. (Obesity Surgery 2003)
  - improvement in BMI after surgery leads to significant improvement in RDI, minimal O2 saturation and sleep efficiency

Hormonal Dysfunction

- Improvement in rates of fertility
- Decrease in pre-eclampsia
- Decrease in c-section rate
- Decrease in PCOS
- Decrease in masculinization

Cardiovascular Risk Reduction

- Lopez-Jiminez, et al.
  - Gastric bypass patients versus untreated group over 13 years
  - GBP group: 10 year risk for cardiac event 37%→18%
  - Untreated group unchanged (30%)
  - Risk modeling predicted 4 deaths and 16 cardiac events prevented per 100 patients in GBP group
- Obesity 2007

Mortality

- Swedish Obesity Study
  - First to demonstrate decreased mortality after surgical weight loss
  - Matched control groups
  - 99.9% follow-up, mean of 10.9 years
  - Mostly restrictive procedures (few GBP)

Mortality

- Hart, et al (Utah)
  - 1984-2002
  - 7925 GBP vs. 7925 matched for age, sex, BMI
  - 7.1 mean follow-up
  - Results
    - 40% ↓ adjusted mortality for surgery group
    - ↓ 92% for mortality due to DM
    - ↓ 56% for cardiovascular disease
    - ↓60% fro malignancy

Impact on Health Care Costs

- Christou, et al (Canada)
  - Matched controls by BMI, sex, age
  - 29% reduction in total direct health care costs within 5 years
  - $5,700 total reduction per patient
  - Cost of surgery amortized over 3.5 years
- Obesity Surg 2004

Impact on health care costs

- Prescription Costs
- Petrick et al (Obesity Surg 2004)
  - DM, HTN, both
  - 77.3% reduction in total costs of medications for these diseases alone
- Pointer, et al (Obesity Surg 2004)
  - All meds
  - 68% cost reduction at 1 year
  - 72% at two years

Conclusion

- Morbid Obesity is an epidemic associated with life threatening and life limiting comorbidities.
- Surgical weight loss can provide the significant, long-term weight loss which may “cure” or improve these comorbid conditions.
- Surgical weight loss will prove more cost effective than nonsurgical treatment.

BRIEF HISTORY OF BARIATRIC PROCEDURES

- EARLY PROCEDURES
  - What worked, what did not and what we learned.
- CURRENT PROCEDURES
  - The "gold standard"
  - What's old is new again
  - A leap of faith
- THE FUTURE
  - Surgical cure for a medical scourge?

THE PAST:RESTRICTION VS. MALABSORPTION

- Gastric restriction
  - Horizontal Gastroplasty (1970's)
  - Horizontal Banded Gastroplasty (1970's)
  - Vertical Banded Gastroplasty (1982)
- Malabsorption
  - Jejuno-ileal Bypass (1969)

THE HYBRIDS

- Gastric Bypass (1967)
- Biliopancreatic Diversion (1975)
- BPD with Duodenal Switch (1988)

GASTROPLASTY

Figure 12
Horizontal
Gastroplasty

HORIZONTAL BANDED GASTROPLASTY

Figure 15
Non-Adjusting
Gastric Banding

VERTICAL BANDED GASTROPLASTY

Figure 13
Vertical Banded
Gastroplasty
(Mason)

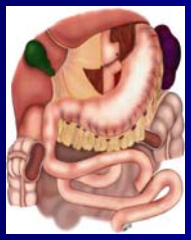
JEJUNO-ILEAL BYPASS

CURRENT PROCEDURES

- Laparoscopic Gastric Bypass (1994)
- Laparoscopic Adjustable Gastric Banding (1990)
- Duodenal Switch (1988)
- Laparoscopic Sleeve Gastrectomy (2004)

Gastric Bypass

- The “gold standard” is under siege.

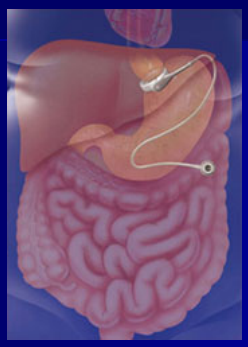


DUODENAL SWITCH/BPD

Laparoscopic Adjustable Gastric Banding

- LapBand
  - FDA approved in 2001
  - Most commonly placed restriction device worldwide
  - Pure gastric restriction

LapBand System



Laparoscopic Adjustable Gastric Banding

- Realize Band
  - FDA approval in 2007
  - Direct descendant of the Swedish Adjustable Band
  - Pure gastric restriction
  - Equivalent results to LapBand

Realize® Band System

Realize Gastric Band

Realize Band System

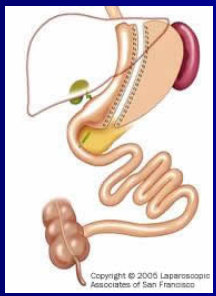
Sleeve Gastrectomy

- Pure gastric restriction
- Originally intended as the first stage of a Duodenal Switch (Biliopancreatic Diversion) procedure on high risk, super obese patients.
- Patients awaiting second stage (1 year later) were noted to have significant weight loss.
- Now being promoted as a primary procedure in super obese patients and lower BMI patients as a substitute for gastric banding.

Sleeve Gastrectomy

- How does it work?
  - Restriction, 120-150 cc stomach
  - 75-85% gastrectomy results in near elimination of detectable ghrelin (appetite stimulation)

Sleeve Gastrectomy



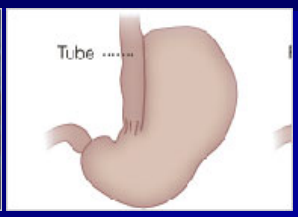
Sleeve gastrectomy

- Results:
  - Jossert, Lee, et al.: 80% EBWL at 2 years
  - Roa, et al.: 53% EBWL at 6 months
  - Ou Yang, et al: 54% EBWL at 1 year, 46% at 2 years
  - Kalfarentzos, et al: 57.6 % at 5 years

What's next? What's Not.

- Gastric pacing
- Expandable intragastric balloons
- Vagotomy
- Endoscopic duodenal sleeve implant
- NOTES

New York Times: 10/21/08



Metabolic Surgery

- Most discussed topic in bariatric surgery
- Note the name change (ASMBS)
- A surgical cure for diabetes

An interesting observation….

- Pories reports in Annals of Surgery in 1992 the first large (608) series of gastric bypass patients with long term (up to 14 years) followup.
  - Noted that 83% of NIDDM had maintained normal levels of plasma glucose, HgA1c, and insulin.
  - "antidiabetic effect appears to be due to a reduction in caloric intake".

- Many subsequent reports document similar improvement in glucose control in Type II diabetics.
- Improvement was seen even days after surgery, before any significant weight loss.

Surgery v. Intensive Medical Therapy

- Schauer, et al. "STAMPEDE"
- Randomized, nonblinded, prospective study
- 150 patients: medical therapy alone, RYGBP, LSG
- Endpoint: A1c < 6.0 at 12 months
  - 42% RYGBP achieved goal (all with no meds)
  - 37% LSG (28% of those needed meds still)
  - 12% medical (overall meds increased in this group)

Surgery v. Intense Medical Therapy

- Mingrone, et al.
- 60 patients randomly assigned IMT, RYGBP, DS
- Endpoints: FBG < 100, A1c < 6.5, no meds)
- 2 year follow up
  - RYGBP: 75% remission
  - DS: 95%
  - IMT: 0%

Mechanism?

- Foregut Hypothesis
- Hindgut Hypothesis

Foregut Hypothesis

- Improved glucose metabolism by excluding the duodenum and proximal jejunum from nutrient flow.
- Prevents secretion of some factor (?) which promotes insulin resistance.
- Mediated by glucose dependent insulinotropic peptide (GIP).

Hindgut Hypothesis

- More rapid delivery of nutrients to the distal intestine leads to improved glucose metabolism.
- Mediated by glucagon-like peptide 1 (GLP1).
  - An "incretin" hormone secreted by L cells in distal bowel
  - Stimulates insulin secretion and has a proliferative effect on pancreatic beta cells.

- What happens in Type II diabetics?
  - Increased GIP in response to nutrients in the duodenum results in increased insulin and decreased plasma glucose.
  - There is also a countering *anti-incretin* secreted to prevent hypoglycemia.
  - Constant GIP stimulation in"predisposed individuals" (Type II diabetics) leads to incretin/anti-incretin balance and resultant increase on glucose.

What's Next?

- Gastric bypass for nonobese Type II diabetics?
  - 2006: first international conference to discuss above.
    - 3 studies (Chile, Mexico, Brazil) early results show similar improvements in glucose control---70-80% of patients.
    - Current studies in U.S. (BMI <30 or 35):
      - Rubino: Columbia
      - Schauer: Cleveland Clinic
      - Univ. Minnesota

The Fallout

- Shock and Awe
  - "I'm skeptical. It bothers me to see this message being put out there that we can now cure diabetes through surgery. They have to prove it to me." R. Robertson, President-Elect, American Diabetes Association.
  - "Thinking about this as just a way to treat diabetes makes no sense. We have lots of ways to treat diabetes. There's always that slippery slope where you start opening the door for one thing and people start using it for another. We live in that kind of culture." David Nathan, MD, Harvard Medical School.