Effects of Bariatric Surgery on Inflammatory, Functional, and Structural Markers of Coronary Atherosclerosis

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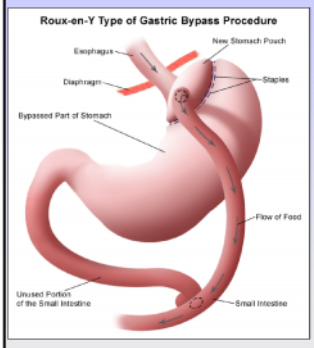
Obesity:

- 2nd leading cause of preventable death in the United States and an independent risk factor for coronary atherosclerosis
- Yearly obesity management costs: approximately $100 billion
- World Health Organization (WHO) classification:
  - Grade 1 (BMI = 25-29.9 kg/m²) – Overweight
  - Grade 2 (BMI = 30-39.9 kg/m²) – Obesity
  - Grade 3 (BMI ≥ 40 kg/m²) – Morbid Obesity
- Approximately 100 million American adults are classified as being overweight or obese:
  - 35% of women
  - 31% of men

Roux-en-Y Gastric Bypass Surgery:



- Established method of achieving long-term weight loss
- More substantial degree and duration of weight loss compared to others variants of gastric bypass surgery
- Loss of 50 to 80% excess body weight
- Swedish Obese Subjects Study:
  - Bariatric surgery was associated with decreased overall mortality

Rationale:

The effects of weight loss associated with Roux-en-Y gastric bypass surgery on markers of coronary atherosclerosis and cardiovascular mortality remain largely undefined

Purpose of the Study:

To determine the effect of weight loss associated with Roux-en-Y gastric bypass surgery on risk markers of coronary atherosclerosis:

- Total cholesterol, LDL, HDL, Triglycerides
- High Sensitivity C-Reactive Protein
- Brachial Artery Flow Mediated Dilation
- Carotid Intimal Medial Thickness

Methods: Study Population

Study Design

Enrollment: December 2004 – January 2006

Inclusion Criteria:

- BMI ≥ 40 kg/m²
- BMI = 35-39.9 kg/m² with ≥ 2 co-morbid obesity related conditions
- Failed attempts at medical weight loss

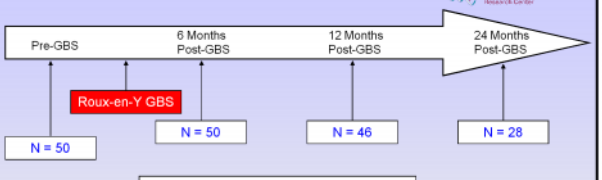
Exclusion Criteria:

- Age < 21 years
- Known chronic inflammatory disorder
- Current tobacco abuse

Baseline Characteristics

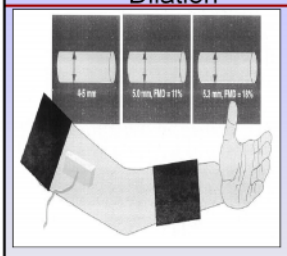
Sex	38 Females 12 Males
Mean Age (years)	45
Mean BMI (kg/m²)	47
History of Hypertension	34/50 (68%)
History of Diabetes Mellitus	20/50 (40%)
History of Dyslipidemia	38/50 (76%)

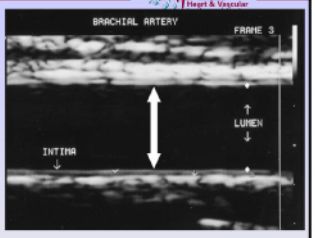
Methods: Measurement of Markers of Coronary Atherosclerosis



- ✓ Body Mass Index
- ✓ Total cholesterol, LDL, HDL, Triglycerides
- ✓ High Sensitivity C-Reactive Protein
- ✓ Brachial Artery Flow Mediated Dilation
  - Measurements conducted in a blinded fashion with consensus of 3 investigators
- ✓ Carotid Intimal Medial Thickness
  - Measurements conducted in a blinded fashion with consensus of 3 investigators

Methods: Measurement of Flow Mediated Dilation



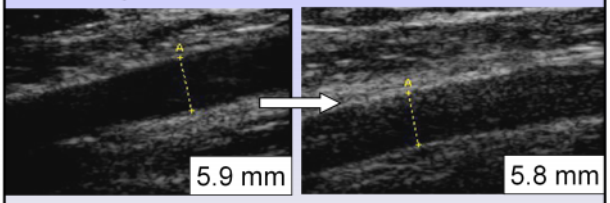


Flow Mediated Dilation (%) = (maximum diameter – baseline diameter) x 100
baseline diameter

Corretti MC, Anderson TJ, Benjamin EJ, Celermajer D, Charbonneau F, Creager M, Deanfield J, Drexler H, Gerhard-Herman M, Herrington D, Vallance P, Vita J, Vogel R. Guidelines for the Ultrasound Assessment of Endothelial-dependent Flow-mediated Dilation of the Brachial Artery: A Report of the International Brachial Artery Reactivity Task Force. J Am Coll Cardiol

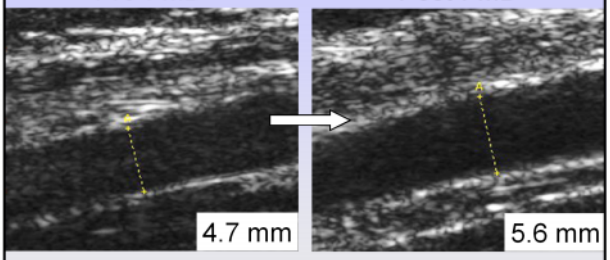
Flow Mediated Dilation Pre-Gastric Bypass Surgery: Endothelial Dysfunction

Pre-FMD | Post-FMD



Flow Mediated Dilation 6 Months Post-Gastric Bypass Surgery: Normal Endothelial Function

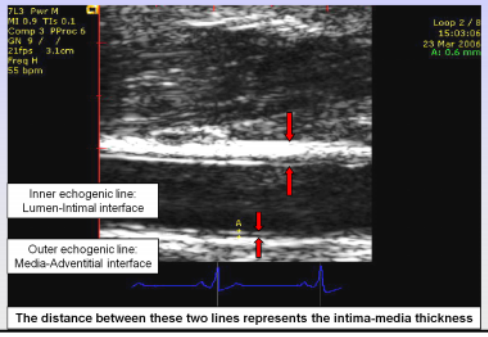
Pre-FMD | Post-FMD



Flow Mediated Dilation = 19.1%

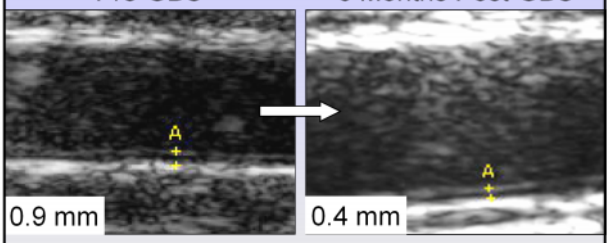
Methods: Measurement of Carotid Intimal Medial Thickness

- Carotid artery images were obtained 1 cm proximal to the bifurcation of the right common carotid artery using standard methods previously established

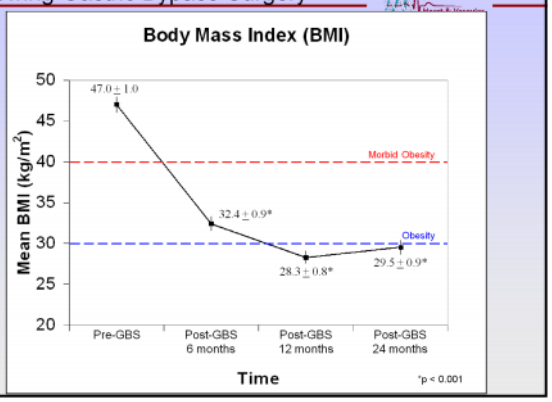


Carotid Intimal Medial Thickness: Improvement 6 Months Post-Gastric Bypass Surgery

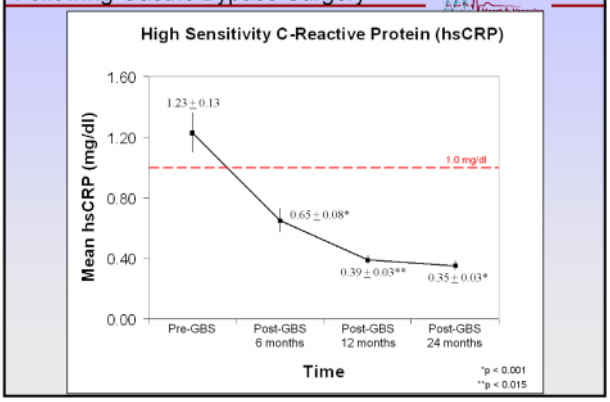
Pre-GBS | 6 Months Post-GBS



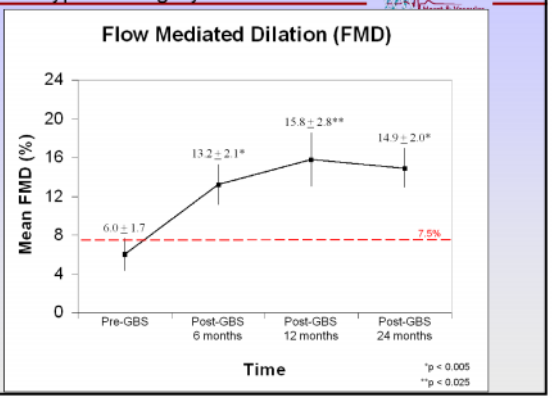
Sustained Decrease in Body Mass Index Following Gastric Bypass Surgery



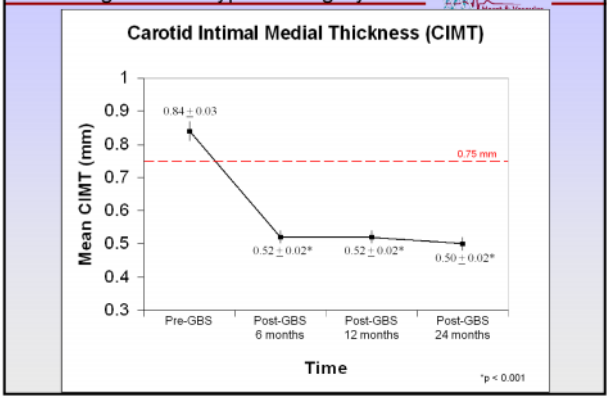
Improvement of High Sensitivity C-Reactive Protein Following Gastric Bypass Surgery



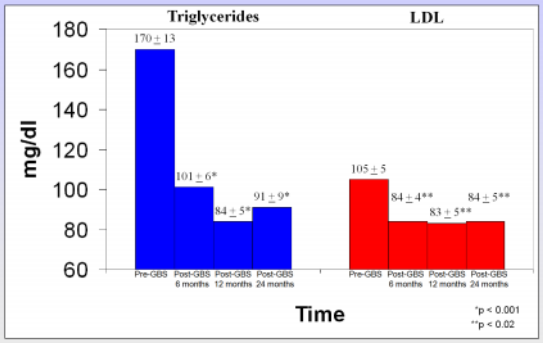
Increased Flow Mediated Dilation After Gastric Bypass Surgery



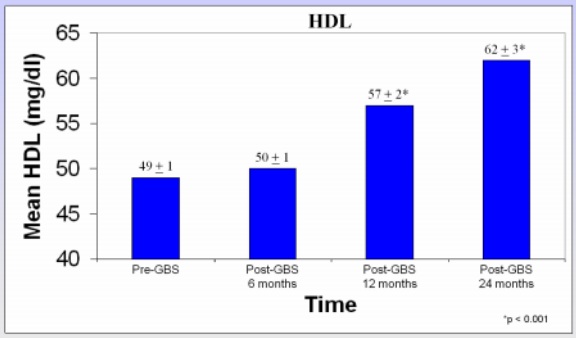
Regression of Carotid Intimal Medial Thickness Following Gastric Bypass Surgery



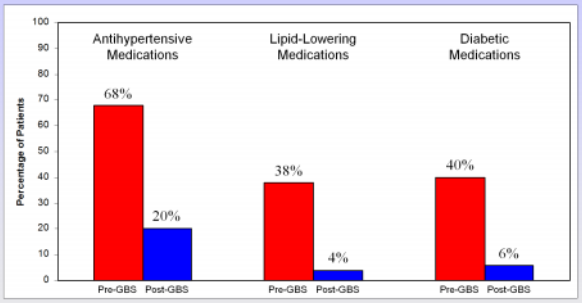
Improvement in Triglycerides and LDL Levels Following Gastric Bypass Surgery



Improvement in HDL Level Following Gastric Bypass Surgery



Decreased Need for Medications 6 Months After Gastric Bypass Surgery



Conclusion:

- Weight loss associated with Roux-en-Y gastric bypass surgery results in significant improvements in inflammatory, structural, and functional markers of coronary atherosclerosis as early as 6 months following surgery, with persistent reversal of atherosclerotic risk markers up to 24 months following surgery.
- Largest and most sustained improvement in FMD following weight loss surgery, suggesting reversal of endothelial dysfunction after gastric bypass surgery.
- Future studies are required to determine whether improvement in these markers of coronary atherosclerotic risk will translate into actual reductions in adverse cardiovascular clinical outcomes.


Thank You