Drug Therapy Following Bariatric Surgery

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Disclosures

Dr. McElhiney “declare(s) no conflicts of interest, real or apparent, and no financial interests in any company, product, or service mentioned in this program, including grants, employment, gifts, stock holdings, and honoraria.”
Learning Objectives

- Describe the ADME process for drugs
- Identify dosage forms that are suitable for bariatric surgery patients
- Explain what medications are needed immediately after surgery
- List recommendations on dosing medications for bariatric surgery patients
- Explain how certain drugs may have a different effect on bariatric surgery patients
My Journey
Facts About Obesity and Weight Loss

- More than 1/3 of US adults have obesity.
- Globally, 1.9 billion adults are overweight and over 600 million are obese.
- In 2014, medical costs associated with obesity cost $147 billion.
- Obese patients have less than 10% success in long-term weight loss.
- Obesity has an increased risk of morbidity from hypertension, dyslipidemia, type-2 diabetes, coronary heart disease, stroke, gall bladder disease, osteoarthritis, sleep apnea, respiratory problems, and various cancers.
WEIGHT LOSS SURGERY IS NOT THE EASY WAY OUT!!!
Types of Bariatric Procedures

Malabsorptive

Roux-en-Y Gastric Bypass (RNY)

Restrictive

Vertical Sleeve Gastrectomy

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Size of the Stomach Before and After WLS
PHARMACOKINETICS

Review of the ADME Process

**Absorption**
- The process by which a drug proceeds from the site of administration to the site of measurement

**Distribution**
- The process of reversible transfer of drug to and from the site of measurement

**Metabolism**
- The process of a conversion of one chemical species to another chemical species

**Elimination**
- The irreversible loss of drug from the site of measurement. It may occur by metabolism or excretion.

Anas Bahmassi PhD 2011
PHARMACOKINETICS

- Intact tablet
- Disintegration
- Deaggregation
- Granules
- Low rate of drug dissolution
- Moderate rate of drug dissolution
- Relatively rapid rate of drug dissolution
- Drug in solution in gastrointestinal fluids
- Absorption
- Drug in blood
PHARMACOKINETICS

Enzymes affect on pharmacokinetics

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PHARMACOKINETICS AFTER WLS

- Disintegration of solid oral dosage forms
- Gastric content and fluids
- Gastric volume and size of passageway
- Gastric pH
- Bypassing upper small intestines
- Taking medications with water or fluids
Dosage Forms Suitable for Bariatric Surgery Patients

- Oral liquids
- Immediate release oral dosage forms
- Suppositories
- Sublingual or Troches/Lozenges
- Injectables
- Inhalations or nasal sprays
- Transdermals
- Chewables and Chews
Dosage Forms Suitable for Bariatric Surgery Patients

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Size of Tablets or Capsules After WLS
Content of Oral Liquids

- Sugar-free if possible
- Limited or no alcohol
- Fixed oil base?
- Immediate release
Dumping Syndrome

**Early Phase**
- Abdominal cramping or pain
- Nausea and/or vomiting
- Severe diarrhea
- Sweating, flushing, light-headedness
- Rapid heartbeat

**Late Phase**
- Fatigue or weakness
- Flushing or sweating
- Shakiness, dizziness, or fainting
- Loss of concentration or mental confusion
- Feelings of hunger
- Rapid heartbeat

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Medications Immediately Following WLS

- Most antihypertensive and antidiabetic agents are discontinued
- All diuretics are discontinued
- Oral liquid pain medications
- Anti-nausea agents
- Proton pump inhibitors
- Ursodiol
- Nutritional supplements
Nutritional Supplements Following WLS
## Nutritional Supplements Following WLS

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Origin or Salt Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>75% natural carotinoids and 25% palmitate</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Sodium ascorbate and ascorbic acid</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Vitamin D₃, cholecalciferol</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>d-alpha tocopherols</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>phytonadione</td>
</tr>
<tr>
<td>Vitamin B₁</td>
<td>Thiamine mononitrate</td>
</tr>
<tr>
<td>Vitamin B₂</td>
<td>riboflavin</td>
</tr>
<tr>
<td>Niacin</td>
<td>niacinamide</td>
</tr>
<tr>
<td>Vitamin B₃</td>
<td>Pyridoxine hydrochloride</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>Folic acid, methylfolate</td>
</tr>
<tr>
<td>Vitamin B₁₂</td>
<td>cyanocobalamin</td>
</tr>
<tr>
<td>Biotin</td>
<td>biotin</td>
</tr>
<tr>
<td>Pantothenic acid</td>
<td>Calcium D-Pantothenate</td>
</tr>
<tr>
<td>Calcium</td>
<td>Calcium citrate</td>
</tr>
<tr>
<td>Iron</td>
<td>Ferrous fumarate, ferrous gluconate</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Magnesium Amino Acid Chelate; glycinate or lysinate</td>
</tr>
<tr>
<td>Zinc</td>
<td>Zinc Amino Acid Chelate</td>
</tr>
<tr>
<td>Selenium</td>
<td>Selenomethionine</td>
</tr>
<tr>
<td>Copper</td>
<td>Copper citrate</td>
</tr>
<tr>
<td>Manganese</td>
<td>Manganese Amino Acid Chelate</td>
</tr>
<tr>
<td>Chromium</td>
<td>Chromium Amino Acid Chelate</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>Sodium molybdate dihydrate</td>
</tr>
</tbody>
</table>
Nutritional Supplements Following WLS

- Multivitamins, 2 daily
- Calcium citrate 500 mg with Vitamin D 400 IU 3 times per day
- Vitamin B complex (if not included in MV)
- Iron (if anemic or depleted iron stores)
- Vitamin B12 SL, injection, or intranasal 12,000 units weekly
- Protein 60-80 grams (minimal) daily
General Guidelines to Adjust Drug Dosing

- Oral liquid dosage forms or chewables are preferred
- Acidic drugs
- Gastric emptying
- Highly lipophilic drugs
- Volume of distribution
- Drugs with a narrow therapeutic index
- Drugs requiring enzymes for absorption
General Guidelines to Adjust Drug Dosing
Alcohol

“You will get twice as tipsy on half as much”
Alcohol

- Enhanced alcohol sensitivity
- Increased risk of alcohol toxicity and alcohol-related problems
- Effects from alcohol may be shorter or longer
- Hypoglycemia
- Use of alcohol discouraged for the first 6 months post-op
NSAIDS and Analgesics

- Most bariatric programs prohibit or discourage the use of NSAIDs
- Increased risk of ulcers
- Acetaminophen is the only accepted OTC analgesic
- Alternatives: compounded transdermal NSAIDs, tramadol
Laxatives

- Daily fiber supplement recommended
- Polyethylene glycol (PEG) products or senna may be taken routinely
- Bisacodyl should only be used occasionally
- Recommend patient initially try at home
- Bowel prep for colonoscopy may be modified
Birth Control

- Pregnancy not recommended for at least 18-24 months post-op
- Oral contraceptives not as effective
- Recommend barrier methods or injectable contraceptives
Acidic Drug Formulations

- Solubility is decreased
- Disintegration of solid dosage forms is decreased
- Example of drugs affected: rifampin, digoxin, simvastatin, ketoconazole, carbamazepine, segeline, iron supplements, warfarin*

  *May normalize after 6 months
Lipophilic Drugs

- Reduction mixing with bile salts result in changes in volume of distribution
- Decreased absorption
- Example of lipophilic drugs: cyclosporine, phenytoin, rifampin, levothyroxine
- Levothyroxine compounded oral suspension may be superior to commercial tablets; decreased TSH levels
Antidepressant Drugs

- Half of bariatric surgery patients report a past or current mental illness, commonly depression
- Almost 40% are taking at least 1 psychotropic drug, commonly SSRI
- Plasma levels of SSRIs are significantly reduced following a RYGB
Antibiotics

- Azithromycin – lower absorption; risk of therapeutic failure
- Ampicillin - bioavailability decreased
- Linezolid – higher concentration observed due to lower clearance
- Moxifloxacin – higher concentration due to increased absorption via enterohepatic circulation
Immunosuppressive Agents

- Cyclosporine A drug levels 50% lower; consider higher doses
- Mycophenolic acid, tacrolimus, and sirolimus lower drug levels reported; monitor and adjust doses accordingly
Antineoplastics

- Imatinib (case report) trough levels were 40-60% lower
- Tamoxifen drug levels may be subtherapeutic; may need to increase dose to 20 mg twice daily
Medications Requiring Enzymes or Carrier Proteins

- CYP3A4 significantly reduced in gastric-bypass patients
- Therapeutic response should be monitored and compared to pre-op response
- Examples of drugs with significantly reduced AUC: citalopram, escitalopram, duloxetine, sertraline, venlafaxine
Miscellaneous Medications

- Avoid drugs that increase risk of gallstones: gemfibrozil, octreotide
- Dextromethorphan absorption significantly faster, but Tmax was shorter
- Digoxin absorption rate is faster
- Furosemide absorption rate is faster
Final Thought

Working to be skinny is discouraging. Working to be healthy is empowering.
Questions
References


https://asmbs.org