A **complication** is an **unexpected** medical or psychological event occurring after surgery. Every effort is taken to prevent complications, but because of the magnitude of gastric bypass and the many medical problems of many of the patients, complications do occur.

Gastric Bypass Mortality

The mortality rate after gastric bypass is 0.18% or about 1 out of 350 people (1/350). The mortality rate for gastric bypass is similar to the mortality rate for other major general surgical procedures done on a group of patients who are obese and have multiple health problems. Risk of dying from any procedure depends on the general health, age, and weight of the individual. Clearly people who are older, have more severe medical problems, and are heavier are much higher risk than younger, healthier, less obese counterparts. The most common causes of death after gastric bypass include pulmonary embolism and infection secondary to staple line or suture line leaks.

Early complications (within the first 2 months after surgery)
5% of patients have some sort of significant complication. About 10% have some sort of minor p

Anastamotic (staple line) leak

<2%

Anesthetic problem

Severe, rare

Arrythmia (cardiac irregularity)

<1%

Blood clots to lungs (pulmonary embolism)

<1%

Heart attack (myocardial infarction)

rare

Incision infection, major

1%

Incision infection, minor

2%

Incision opening (fascial dehiscence)

rare

Kidney failure

rare

Pneumonia

<1%

Potassium deficiency

rare

Stroke

rare

Thrombophlebitis

<1%

Transfusion

1%

Late complications (after first two months after surgery)

Anastamotic ulcer

1 - 3%

Anastamotic stricture (last 300 patients)

1 - 3%

Anemia, iron deficiency

Rare if iron replaced, common if not

B12 deficiency

Rare if B12 replaced, 30% if no B12 supplement

Incision hernia

Rare for laparoscopic cases, 10 - 20 for open cases

Potassium deficiency

rare

Psychological challenges (significant)

5-10%

Small bowel obstruction (due to adhesion or internal hernia

1 - 3%

This list is indicated to illustrate the type and frequency of complications following gastric bypass in our p

Gastric Bypass: Iron Deficiency

Iron deficiency can be a problem following Gastric Bypass because iron is partially absorbed in the duodenum. The duodenum is bypassed along with the stomach. Iron deficiency can be a particular problem for women who lose blood (and thus iron) with their menses.

We recommend that all gastric bypass patients eat foods that are high in iron, and that iron and hemoglobin levels be checked once or twice a year. For menstruating women we suggest a daily iron supplement such as ferrous sulfate or ferrous gluconate 300 to 350mg per day.

Iron absorption seems to be enhanced by adequate Vitamin C intake . We suggest that all patients take a full potency multivitamin daily. Most multivitamins contain about 60mg Vitamin C. This should be adequate under normal conditions. When one is iron deficient and trying to replace iron stores, increasing Vitamin C intake to 500mg per day may be helpful.

Iron containing foods:

- Organ meats such as liver
- Meat, fish, and poultry
- Shellfish, especially oysters
- Dried beans and peas
- Whole-grain products such as breads and cereals
- Dark-green leafy vegetables such as spinach and broccoli
- Dried fruits such as figs, raisins, apricots, and dates

Related Medical Journals & Articles

Prophylactic iron supplementation after Roux-en-Y gastric bypass: a prospective, double-blind, randomized study.

Brolin RE, Gorman JH, Gorman RC, Petschenik AJ, Bradley LB, Kenler HA, Cody RP

OBJECTIVE: To determine whether prophylactic oral iron supplements (320 mg twice daily) would protect women from iron deficiency and anemia after Roux-en-Y gastric bypass.
DESIGN:
Prospective, double-blind, randomized study in which 29 patients received oral iron and 27 patients received a placebo beginning 1 month after Roux-en-Y gastric bypass.
SETTING:
Tertiary care medical center.
PATIENTS AND INTERVENTIONS:
Complete blood cell count and serum levels of iron, total iron binding capacity, ferritin, vitamin B12, and folate were determined preoperatively and at 6-month intervals postoperatively in 56 menstruating women who had Roux-en-Y gastric bypass.
MAIN OUTCOME MEASURE:
Incidence of iron deficiency and other hematological abnormalities in each treatment group.
RESULTS:
Hemoglobin, hematocrit, and vitamin B12 levels were significantly decreased compared with preoperative values in both groups. Conversely, folate levels increased significantly over time in both groups. Oral iron consistently prevented development of iron deficiency in the iron group. Ferritin levels did not change significantly in the iron group. However, in placebo-treated patients, ferritin levels 2 years postoperatively were significantly decreased compared with preoperative levels. There was no difference in the incidence of anemia between the 2 groups. However, the incidence of microcytosis was substantially greater (P=.07) in placebo-treated than iron-treated patients.

CONCLUSIONS: Prophylactic oral iron supplements successfully prevented iron deficiency in menstruating women after Roux-en-Y gastric bypass but did not consistently protect these women from developing anemia. On the basis of these results we now routinely recommend prophylactic iron supplements to menstruating women who have Roux-en-Y gastric bypass.

Arch Surg 1998 Jul;133(7):740-4

Iron absorption and therapy after gastric bypass.

Rhode BM, Shustik C, Christou NV, MacLean LD.

Department of Surgery, Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada.

BACKGROUND: Iron deficiency anemia is a common complication of gastric bypass. The authors assessed the value of taking vitamin C with oral iron in correcting deficiencies in iron stores and anemia postoperatively. **MATERIALS AND METHODS:** Iron absorption tests were performed on 55 patients 3.2+/-2.0 years after isolated gastric bypass to identify those at higher risk for the late development of anemia. Twenty-nine of this group agreed to a therapeutic trial of iron alone or with vitamin C over a 2-month period. All 55 patients were followed up for 27.1+/-1.0 months following the study.
RESULTS:
The iron absorption test identified patients with low iron stores, as indicated by low serum ferritin, and those with sufficient absorption surface to benefit from oral iron. The addition of vitamin C appears to enhance the therapeutic effect of iron by correcting ferritin deficits ($P < 0.01$) and anemia ($P < 0.05$). Differences in intestine length bypassed by the operation (10 vs. 100 cm) did not affect late ferritin and hemoglobin values.

CONCLUSION: This study suggests but does not prove that the addition of vitamin C to iron therapy after gastric bypass is more effective in restoring ferritin and hemoglobin than iron alone. These results are in contrast with the outcome 22.8 months later, when approximately 50% of study patients were again anemic. Closer follow-up of patients is urgently needed.

Obes Surg 1999 Feb;9(1):17-21

The role of vitamins in the prevention and control of anaemia.

Fishman SM, Christian P, West KP.

Division of Human Nutrition, Johns Hopkins School of Hygiene and Public Health, Baltimore, MD 21205, USA.

OBJECTIVE: While iron deficiency is regarded as the major cause of nutritional anaemia, changes in vitamins A, B12, C and E, folic acid and riboflavin status have also been linked to its development and control. This paper provides a systematic review of vitamin supplementation trials relating to the control of nutritional anaemia. METHODS: A MEDLINE search was used to find reports of vitamin supplementation trials that reported changes in anaemia or iron status. RESULTS: Vitamin A can improve haematological indicators and enhance the efficacy of iron supplementation. Both folate and vitamin B12 can cure and prevent megaloblastic anaemia. Riboflavin enhances the haematological response to iron, and its deficiency may account for a

significant proportion of anaemia in many populations. Vitamin C enhances the absorption of dietary iron, although population-based data showing its efficacy in reducing anaemia or iron deficiency are lacking. Vitamin E supplementation given to preterm infants has not reduced the severity of the anaemia of prematurity. Vitamin B6 effectively treats sideroblastic anaemia. Multivitamin supplementation may raise haemoglobin (Hb) concentration, but few studies have isolated the effect of multivitamins from iron on haematological status.

CONCLUSIONS: In general, the public health impact of vitamin supplementation in controlling anaemia is not clear. Neither are the complex interactions involving multiple vitamins in haematopoiesis sufficiently understood to explain the observed variability in haematological responses to vitamins by age, population, vitamin mixture and dosages. Further research is needed to understand the roles of individual and combined vitamin deficiencies on anaemia to design appropriate micronutrient interventions to prevent anaemia.

Public Health Nutr 2000 Jun;3(2):125-50

[Please note: This is a very broad review article dealing with many causes of anemia. The people studied in the papers covered by this review were not gastric bypass patients. So while the review is interesting it may or may not apply to gastric bypass patients. CDC]

Are any oral iron formulations better tolerated than ferrous sulfate?

- Clinical inquiries: from the family practice inquiries network

Todd McDiarmid, E. Diane Johnson

EVIDENCE-BASED ANSWER Ferrous salt preparations (ferrous sulfate, ferrous gluconate, and ferrous fumarate) are equally tolerable. (Grade of recommendation: A, based on randomized controlled trial.) Controlled-release iron preparations cause less nausea and epigastric pain than conventional ferrous sulfate (grade of recommendation: A, based on randomized controlled trials), although the discontinuation rates between the 2 iron formulations were similar. Ferrous sulfate remains the standard first-line treatment of iron-deficiency anemia given its general tolerability, effectiveness, and low cost.

EVIDENCE SUMMARY A randomized, double-blinded, placebo-controlled study in 1496 subjects examined side-effect rates of 3 iron salt formulations using equal dosages of elemental iron (Table). (1) Gastrointestinal (GI) side-effect rates were not significantly different. The side-effect rate in the ferrous sulfate group (23%) was significantly different from that of the

placebo group (14%); thus, for every 11 patients treated with ferrous sulfate, 1 patient would have GI side effects attributable to the iron salt (number needed to harm [NNH] = 11).

Two formulations--controlled-release iron preparations and polysaccharide-iron complexes--decrease the amount of iron presented to the proximal GI tract. Three large randomized trials assessed tolerability of controlled-release iron preparations compared with ferrous sulfate. (2-4) The only double-blinded study found a lower rote of nausea and epigastric pain in the controlled-release iron formulation among 1376 blood donors receiving 200 mg/day elemental iron (3.3% vs 6.4%, P < .05, NNH = ~32). (2) A nonblinded randomized trial of 543 nonanemic adult patients taking 50 mg/day elemental iron also found a lower rote of stomach-related side effects in the controlled-release group (12.2% vs 27.2%, P < .001, NNH = ~7). (3) However, none of the 3 studies showed a difference in the discontinuation rates between the 2 iron formulations. Comparative constipation rates among the trials were conflicting.

Journal of Family Practice, June, 2002

Lactose, the natural sugar found in milk products, is digested in the small bowel by means of the enzyme lactase. About 10% of adults in the United States are lactose intolerant. They do not have enough lactase to digest milk. When they eat milk or milk products, they develop crampy abdominal pain, bloating and diarrhea. Lactose intolerance can be acquired after gastric bypass or other gastric surgeries by as many as 10% of patients. When a person with a normal stomach drinks milk, it accumulates in the stomach and then is released slowly into the small intestine. There is enough lactase available to handle a small amount of milk at a time. After gastric bypass, milk passes directly through the gastric pouch into the small bowel at a much higher rate. The milk overwhelms the available enzyme and the lactose intolerance symptoms occur.

The strategies to deal with lactose intolerance that develops after surgery are to take milk products more slowly, eat thicker products such as yogurt or cheese rather than liquids milk, avoid milk products all together, or take an enzyme substitute Lactaid with meals.

The following information on the lactose-controlled diet and use of lactaid was provided by Marylyn Swift, RD from a hospital dietary manual. The use of lactaid is described in the text.

Lactose-Controlled Diet

Purpose The lactose-controlled diet is designed to prevent or reduce gastrointestinal symptoms of bloating, flatulence, cramping, nausea, and diarrhea associated with consumption of the disaccharide lactose.

Use The lactose-controlled diet is indicated for individuals with lactose intolerance or lactase deficiency (also called lactase nonpersistence). Individuals with primary lactase deficiency tolerate various levels of lactose while those having rare congenital lactase deficiency require strict avoidance of lactose-containing foods. Secondary lactose intolerance or lactase deficiency is usually transient and develops secondary to illness or disease and often requires limitation or avoidance of lactose.

Modifications

The diet is a general one that restricts or eliminates lactose-containing foods. Lactose is primarily found in dairy products but may be present as an ingredient or component of various food products. (See Table 1 for lactose content of common foods and beverages.) Depending on individual tolerance, limiting products with lactose may help to alleviate symptoms.

Labels should be read carefully to identify sources of lactose. Dairy products that include milk, milk solids, whey, lactose, curds, skim milk powder, skim milk solids, sweet or sour cream, buttermilk, or malted milk are sources of lactose. Other possible sources of lactose are breads, candy, cookies, cold cuts, hot dogs, bologna, commercial sauces and gravies, dessert mixes, cream soups, some ready-to-eat cereals, frostings, chocolate drink mixes, salad dressings, sugar substitutes, and medications.

Dairy products can be consumed depending on individual tolerance. Most persons with lactase nonpersistence can consume milk without the development of symptoms, particularly if small portions of milk (4 fl oz to 6 fl oz) or lactose-containing foods are eaten at separate times during the day. The ingestion of solid food with lactose-containing beverages modifies lactose malabsorption.2 Food solids delay gastric emptying and/or provide endogenous lactase additional time to digest lactose.2.3 Cocoa and chocolate milk have a suppressive effect on human lactose intolerance as evidenced by significantly lowered mean breath hydrogen, bloating, and cramping.

LACTOSE CONTENT OF COMMON FOODS AND

BEVERAGES

Product	Lactose (g)
Milk (1 cup)	
Whole	11
1% and 2% low-fat	9-13
Skim	12-14

Evaporated

24

Sweetened, condensed

30

Chocolate

10-12

Buttermilk

9-11

Yogurt, low-fat (1 cup)

11-15

Cottage cheese (1 cup)

5-8

Pasteurized processed cheese food (1 oz)

0.5-2

Other cheeses (1 oz)

0.4-0.8

Icecream (lcup)

9

Icemilk (1 cup)

10

Sherbet, orange (1 cup)

4

Half and half, light cream, whipped cream topping (1 tbsp)

0.5

Sourcream (ltbsp)

<1

Lactose-reduced dairy products are available and are suitable substitutions for conventional lactose-containing products. Commercial products are available with varying degrees of lactose reduction. A 50% level of lactose reduction may be adequate to relieve signs and symptoms of milk intolerance in the majority of healthy adults with lactose malabsorption.5 Individuals may choose to use onventional dairy products and reduce the lactose levels themselves with commercially available, lactase enzyme drops or tablets. It has been suggested that yogurt is as effective as hydrolyzed lactose milk in alleviating symptoms of lactose intolerance.6 Lactase activity in yogurt may vary across brands.7 Yogurt that has endogenous cultures added post-pasteurization has more lactase activity.

Adding complex carbohydrates or soluble fiber may alleviate symptoms that originate in the small bowel.' The ingestion of milk with food and fiber components in the diet has been shown to improve symptoms of lactose intolerance.2 Dietary treatment for lactose intolerance in children incorporates some of the same recommendations as those made for adults. Specialized lactose-reduced products, as well as cultured and fermented dairy products, may be used in varying degrees for lactose-intolerant children. Ingestion of lactose- containing foods with solid food and fiber-containing food is recommended.

Infants with primary lactose intolerance should be managed with lactose-free, soy-based formulas or hydrolysate formulas if they are allergic to intact protein.8 Management of secondary lactose ntolerance is variable; well-nourished infants with nondehydrating gastroenteritis may be managed safely with diluted or even full-strength cow's milk formula after initial rehydration with a glucose-electrolyte solution.8

Related Physiology Primary lactase deficiency, a condition where the lactase enzyme activity level falls post weaning, is a common development with aging. It is most commonly seen in African Americans, Hispanics, Native Americans, Asians, and people of Jewish descent. Adult lactase deficiency is the most common of all enzyme deficiencies; well over half the world's adults are lactose intolerant .9 Secondary lactase deficiency can be attributed to mucosal injury from a condition or disease process such as regional enteritis, ulcerative colitis, Crohn's disease, gluten-induced enteropathy, and parasitic infections, or following antibiotic therapy and surgical procedures including gastrectomy, extensive bowel resection, and gastric bypass.

GUIDELINES FOR FOOD SELECTION FOR LACTOSE-CONTROLLED DIET

Beverages

All beverages with allowed ingredients, soybean milks, other lactose-free supplements, lactose-hydroly

Milk, milk products, or acidophilus milk as tolerance dictates

Breads and cereals

Whole-grain or enriched breads and cereals

Depending on tolerance, some breads and cereals prepared with milk or milk products may need to be

Desserts

Cakes, cookies, pies; flavored gelatin desserts; water ices made with allowed foods

Any prepared with milk or milk products (eg, sherbet, ice cream, ice milk, custard, pudding, commercial

Fats

Butter or margarine; salad dressings; nondairy creamer; all oils

Any prepared with lactose-containing ingredients

Fruits

All fruits and juices

None

Meats and meat substitutes

All meats, poultry; fish; eggs; peanut butter; dried peas and beans; hard, aged, and processed cheese,

Cold cuts and frankfurters that contain lactose filler; cottage cheese

Potatoes and potato substitutes

Potatoes; enriched rice; barley; noodles, spaghetti, macaroni, and other pastas

Potatoes or substitutes prepared with milk or milk products; mixes prepared with lactose-containing ingr

Soups

Broth, bouillon; soups made with allowed ingredients

Soups made wit milk or milk products

Sweets

Sugar; corn syrup; pure maple syrup; honey; jellies, jams; pure sugar candies; marshmallows

Chocolate; caramels; any candies made with lactose containing ingredients

Vegetables

All

Vegetables prepared with milk or milk products

Miscellaneous

All spices, seasonings, flavoring

Any prepared with milk or milk products

Lactose tolerance is variable; if an individual is asymptomatic, no restrictions are indicated, If an individual experiences adverse reactions to lactose, following a lactose-controlled diet is advisable. Symptoms associated with lactose intolerance usually subside within 3 to 5 days on a lactose- controlled diet.

Individuals can often identify discomfort associated with digesting lactose; however, true lactase deficiency can be diagnosed clinically with a breath hydrogen test. The breath hydrogen test measures hydrogen produced by colonic bacteria in the presence of unabsorbed sugars.

Adequacy Depending on individual choices, the diet can provide adequate amounts of all essential nutrients.. When dairy products are limited intake of calcium phosphorus, vitamins A and D, and riboflavin may be deficient. Use of dairy products within individual tolerance level and/or use of lactose hydrolyzed milk and milk products could satisfy these nutrient needs. Calcium supplementation is indicated if the diet does not provide adequate calcium.

Lactaid can be purchased in tablets, drops, or as lactase-treated milk and cheese products. Lactaid products are distributed by:

McNeil CPC
7050 Camp Hill Road
Fort Washington , PA 19034
Lactaid Hotline: 800ILACTAID, 9 am -5 pm Eastern time,
Monday through Friday

Dairy Ease products including tablets, drops, and lactase-treated milk are produced by:

Sterling Health
Division of Sterling Winthrop
90 Park Avenue

Thiamine (Vitamin B1) Thiamine, also spelled thiamin, is a water-soluble vitamin found in such foods as yeast, cereal grains, legumes, peas, nuts, port, and beef. This vitamin is essential to a number of metabolic processes, especially in the processing of carbohydrates.

The normal minimal daily requirement of thiamine is 1.4 mg. This amount of vitamin is usually readily obtained from a normal diet. However after gastric bypass, especially in the early post op period, it may be difficult to eat enough food to get enough of the vitamin. There may also be problems with thiamine absorption in some patients. We therefore recommend a daily multivitamin that contains Thiamine and routine thiamine supplementation.

Childrens' or adult chewable vitamins are convenient during the first 6 weeks post op. We recommend that the patient take one chewable adult Centrum or chewable Bugs Bunny Complete vitamin twice a day for the first 6 weeks. For the next 6 weeks we still recommend taking the vitamins twice a day, but they may be swallowed or chewed. After the first three months we reduce the vitamin dose to one pill once a day. We also recommend thiamine 100 mg (swallowed) daily for the first three months. (Thiamine is water soluble and excessive

thiamine is excreted by the kidneys. Thiamine toxicity has not been described in the medical literature.)

Thiamine deficiency Acute thiamine deficiency was originally recognized in patients who were having significant problems taking foods due to a tight pouch or an ulcer and in patients who failed to take multivitamins. When we became aware of the early symptoms, we started to measure blood thiamine levels more routinely. We began to find patients with mild nonspecific symptoms who were otherwise doing well. We therefore started to recommend routine supplementation early on and monitor blood levels later.

Acute thiamine deficiency appears as a nonspecific syndrome: headache, mental clouding, nausea, malaise, myalgias (muscle aches and pains). As it worsens the patient develops more severe mental changes including depression, amnesia, inability to learn, confabulation (making up stories unintentionally), and hallucinations. Additional neurological problems can appear. These include a wide unstable gait (walking pattern), and motor weakness. Finally some patients develop congestive heart failure and peripheral edema (swelling).

Treatment of thiamin deficiency Treatment of mild thiamin deficiency is simple oral supplementation. Treatment of severe acute thiamine deficiency is done by giving high doses of intravenous thiamine for several days. If the deficiency is recent complete recovery is expected. However if it is severe and chronic with marked mental and motor impairment, complete recovery occurs in only half of the patients. Thiamine deficiency is diagnosed by the history of frequent vomiting and the symptoms listed above. A blood test confirm the diagnosis, but treatment is never delayed because the test can take several days to process.

Monitoring thiamin levels We monitor thiamin levels by measuring whole blood thiamin at 6 weeks, 3 months, 6 months, and one year post op. For the long term, we recommend monitoring thiamin every 6 months. Careful monitoring is important because the onset of thiamin deficiency can be insidious and the effects can be serious and permanent.

Prevention of thiamine deficiency During the first three months after surgery we place all patients on B1 100 mg daily as well as on multivitamins. We have started routine supplementation because we have documented that quite a few patients develop mild to moderate deficiency symptoms early on. Later when patients can eat a broader variety of foods in greater quantity we recommend daily multivitamins and then monitor B1 levels in the blood.

Jeopardy answer: What is Beriberi

Jeopardy question: What is the archaic (old fashioned) name for Thiamine deficiency?

A spasmodic rigidity of the lower limbs, etc.; an acute disease occurring in India, and commonly considered the same as Barbiers, - but the latter is a chronic disease. The word beriberi is, in all probability, derived from the reduplication of the Hindu word beri, signifying irons or fetters fastened to the legs of criminals, elephants, etc. A person afflicted with this disease is literally :fettered." [Thomas1875]

An acute disease occurring in India, characterized by multiple inflammatory changes in the nerves, producing great muscular debility, a painful rigidity of the limbs, and cachexy. [Webster1913]

A disease caused by a deficiency of thiamine, endemic in eastern and southern Asia and characterized by neurological symptoms, cardiovascular abnormalities, and edema. [Heritage].

From Ruby's list of archaic medical terms:
http://www.antiquusmorbus.com/English/EnglishB.htm

Vitamin B12 (Cyanocobalamin)

It is a water-soluble hematopoietic (necessary for manufacture of red blood cells) vitamin occurring in meats and animal products. To be absorbed by the intestine, B12 must combine with intrinsic factor, and its metabolism is interconnected with that of folic acid. The vitamin is necessary for the growth and replication of all body cells and the functioning of the nervous system. Deficiency of vitamin B12 causes pernicious anemia and other forms of megaloblastic anemia, and neurologic lesions.

Vitamin B12 is stored in the liver. A healthy adult has a large reserve supply of B12 available, and B12 levels tend to change slowly.

We recommend that our patients take sublingual B12, 1000 micrograms per week. Sublingual means "under the tongue". B12 supplements that are swallowed don't get absorbed well. Sublingual preparations are in a crystalline form and can be absorbed directly into the blood stream through the tissues under the tongue.

Your B12 level can be checked with a blood test. We recommend that your level be tested every six months so that you can be sure that you have enough of this important vitamin.

The following abstracts were gathered from the medical literature. To search for others: PubMed .

Are vitamin B12 and folate deficiency clinically important after roux-en-Y gastric bypass?

Brolin RE, Gorman JH, Gorman RC, Petschenik AJ, Bradley LJ, Kenler HA, Cody RP

Although iron, vitamin B12, and folate deficiency have been well documented after gastric bypass operations performed for morbid obesity, there is surprisingly little information on either the natural course or the treatment of these deficiencies in Roux-en-Y gastric bypass (RYGB) patients. During a 10-year period, a complete blood count and serum levels of iron, total iron-binding capacity, vitamin B12, and folate were obtained in 348 patients preoperatively and postoperatively at 6-month intervals for the first 2 years, then annually thereafter. The principal objectives of this study were to determine how readily patients who developed metabolic deficiencies after Roux-en-Y gastric bypass responded to postoperative supplements of the deficient micronutrient and to learn whether the risk of developing these deficiencies decreases over time.Hemoglobin and hematocrit levels were significantly decreased at all postoperative intervals in comparison to preoperative values. Moreover, at each successive interval through 5 years, hemoglobin and hematocrit were decreased significantly compared to the preceding interval. Folate levels were significantly increased compared to preoperative levels at all time intervals. Iron and vitamin B12 levels were lower than preoperative measurements and remained relatively stable postoperatively. Half of the low hemoglobin levels were not

associated with iron deficiency. Taking multivitamin supplements resulted in a lower incidence of folate deficiency but did not prevent iron or vitamin B12 deficiency. Oral supplementation of iron and vitamin B12 corrected deficiencies in 43% and 81% of cases, respectively. Folate deficiency was almost always corrected with multivitamins alone. No patient had symptoms that could be attributed to either vitamin B12 or folate deficiency Conversely, many patients had symptoms of iron deficiency and anemia. Lack of symptoms of vitamin B12 and folate deficiency suggests that these deficiencies are not clinically important after RYGB. Conversely, iron deficiency and anemia are potentially serious problems after RYGB, particularly in younger women. Hence we recommend prophylactic oral iron supplements to premenopausal women who undergo RYGB.

J Gastrointest Surg 1998 Sep-Oct;2(5):436-42

Late effects of gastric bypass for obesity.

Crowley LV, Seay J, Mullin G.

We studied **41 patients** who had gastric bypass for obesity from 1974-1979. The procedure was well received by patients and **most achieved adequate weight loss**, but most subjects consumed inadequate diets and **many developed iron and/or vitamin B12 deficiencies**. Ten were anemic and 13 had been treated previously for postbypass anemia. Severely vitamin B12-deficient subjects did not respond to 50 micrograms oral vitamin B12 tablets, but those with milder deficiencies usually did. Schilling tests were usually abnormal and corrected when intrinsic factor was given. Many subjects developed manifestations compatible with **osteoporosis** due to inadequate calcium intake and absorption, and some also developed abnormal laboratory tests suggesting coexisting **osteomalacia**. Hematopoietic complications of gastric bypass can usually be prevented and are relatively easy to treat, but musculoskeletal complications may be more difficult to prevent and treat.

Am J Gastroenterol 1984 Nov;79(11):850-60

Thus we suggest that all patients take supplemental B12, Iron, and Calcium.