Nutrition in **Cholelithiasis**

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Introduction

- Gallstone disease affects millions of people each year and causes significant morbidity
- In most cases gallstones are asymptomatic
- The large majority of gallstones have cholesterol as their primary component
- smaller number are composed primarily of calcium salts, of bilirubin and phosphate

Etiology

- Multifactorial: interaction of genetic and environmental
- Exogenous factors:
  - Long-term high intake of fat
  - high intake of refined carbohydrates
  - high prevalence of obesity
  - non-insulin dependent diabetes
  - atherosclerosis
  - sedentary life-style
  - Rapid weight loss

Dietary risk factors for gallstone

- low-fiber/ high in refined sugar
- high-fat (animal and saturated fat)
- westernized diets
- high animal protein

Simple sugar and Gallstone

- **Individuals consuming refined carbohydrates have a 60% greater risk for developing gallstones compared with those consume more fiber specially insoluble fiber**
- **40 grams of sugar per day doubles the risk of symptomatic gallstones**
- **This finding was attributed to a higher synthesis of cholesterol in the liver secondary to an increase in insulin secretion.**

Fiber and gallstone

- Insoluble fiber intake is inversely associated to gallbladder disease
- Fiber supplementation of obese patients who are losing weight, could prevent gallstones development
- Fiber may protect against gallstone formation by
  - speeding intestinal transit
  - reducing the generation of secondary bile acids such as deoxycholate which has been associated with increased cholesterol saturation of the bile

Vitamin C

- Vitamin C deficiency reduces cholesterol 7 -hydroxilase activity, leading to cholesterol supersaturation of bile and formation of cholesterol gallstones

- Supplementation with vitamin C (2 g per day during two weeks) induced changes in bile composition and prolongation of nucleation time, suggesting that vitamin C supplementation may also influence the conditions for cholesterol crystal formation in humans
- Data from more than 13,000 American adults showed that serum ascorbic acid levels was inversely related to prevalence of clinical and asymptomatic gallbladder disease among women, but not among men.
- They also observed that ascorbic acid supplementation among women was associated with a lower prevalence of clinical gallbladder disease
- They detected that among women that consumed alcohol, ascorbic acid supplement was independently associated with a 50% reduction in prevalence of

Other vitamins and minerals

- Some studies found an inverse association between dietary calcium and gallbladder disease
- Calcium has been hypothesized to protect against gallstones by
  - binding secondary bile acids including deoxycholate in the small intestinal lumen, thus reducing the deoxycholate and cholesterol content of the bile.
- An inverse association has also been observed with
  - dairy products
  - Folate
  - vitamin E
  - magnesium deficiency

Coffee

- Coffee components
  - stimulate cholecystokinin release,
  - enhance gallbladder motility
  - inhibit gallbladder fluid absorption
  - decrease cholesterol crystallization in bile
  - increase intestinal motility
  - down-regulate the hepatic low density lipoprotein receptor
  - decrease 3-hydroxyl-3-methylglutaryl Co A reductase activity

Fats and gallstone

- Several studies reported that subjects with cholelithiasis exhibit a higher consumption of total lipids, mainly saturated fatty acids.
- French study showed a positive association between gallstone disease and total and saturated fat intake
- Animal studies have shown that feeding monounsaturated fatty acids (MUFA), compared to saturated fats, may decrease the risk of gallstone formation

Omega-3 fatty acid and gallstone

- populations consuming a diet rich in fish oil and n-3 fatty acids exhibit a low incidence of cholesterol cholelithiasis
- In animal studies, feeding a lithogenic diet with fish oil supplementation induced a significant reduction of both cholesterol monohydrate crystal nucleation and gallstone formation
- n-3 PUFA supplementation of obese women on weight reduction treatment could prevent the decrease in nucleation time and the increase of cholesterol saturation index (observed during rapid loose of weight), resulting in the prevention of cholesterol gallstones formation

Mechanism of omega-3 FAs

- changes in cholesterol metabolism that could reduce biliary cholesterol saturation
- reduction in cholesterol precipitation by changes in the composition of biliary phospholipids
- reduction in biliary protein concentration
- decrease in biliary calcium levels that might also reduce cholesterol precipitation has been reported

Thank you
for your attention