



Original Article

The Effect of Moderate Alcohol Intake on Gallbladder Motility: A Milk Ultrasonographic Study

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ABSTRACT

Objectives: To assess the effect of periodic and moderate alcohol intake on gallbladder motility. **Methods:** The ultrasonographic ellipsoid method was used in 21 healthy male subjects: 12 non-alcohol and 9 alcohol drinkers. The stimulus for gallbladder contraction was 165 ml of half cream milk. Gallbladder dynamics were studied for 20 minutes following the ingestion of the milk. The mean percentage change in gallbladder volume after 10 and 20 minutes gave indications of gallbladder motility. **Results:** Moderate and periodic alcohol intake did not stimulate rapid postprandial gallbladder emptying. **Conclusion:** The protective effect of alcohol against biliary cholesterol cholelithiasis could not be due to stimulation of gallbladder emptying.

INTRODUCTION

Several studies have evaluated the role of diet as a potential risk factor for gallstone formation, including energy intake, cholesterol, fatty acids, fiber, carbohydrates, vitamins, minerals, and alcohol [1]. The resultant side effects and complications of heavy or excessive drinking include malnutrition, poor dietary intake, and frequent and non-specific digestive disorders, such as malabsorption, gastritis and epigastric discomfort [2,3].

In gallstone patients, a decreased turnover of bile may contribute to cholesterol crystal precipitation and stone growth [4]. At a daily dose of 39 g, alcohol reduces the lithogenic index of bile but its effect on motility is still debated [5]. *In vitro*, ethanol exerts direct inhibitory action on guinea pig gallbladder contraction by lowering the calcium sensitivity of the contractile apparatus of smooth muscles [6]. However *in vivo* it is unlikely that ethanol consumption would affect gallbladder motility owing to the tolerance produced towards the acute inhibitory action of ethanol. In another study, chronic ethanol administration to guinea pigs produced tolerance to *in vitro* gallbladder contractility mediated by the Ca²⁺ entry through L-type Ca²⁺ channels linked with

protein kinase C activation [7]. Chronic alcohol consumption was reported that has no irreversible effects on clinical relevance of postprandial gastrobiliary motility, in contrast to the well documented reversible effects of acute alcohol consumption on gastric motility [8].

The motility of gallbladder was tested by using the Lundh test meal as a stimulus [5]. Using a crossover method, this meal was ingested by each subject once with water and once with alcohol, and gallbladder kinetics were studied for 90 min. This study showed that alcohol stimulated rapid postprandial gallbladder emptying and accelerated gallbladder filling, and concluded that the protective effect of alcohol against biliary cholesterol cholelithiasis could be due to stimulation of gallbladder emptying and/or acceleration of gallbladder filling.

Gallbladder dysmotility is a well documented risk factor in the formation of gallstones. The abnormal gallbladder motility was linked to the pathogenesis of gallstones and other gallbladder conditions [9]. Other risk factors for gallstone disease include age, high body mass

index, diabetes mellitus and glucose intolerance [10].

Alcohol intake is a common habit among the Ibo population of Nigeria. While studies elsewhere have investigated the effect of alcohol on gallbladder motility, there has not been any study in the Ibo population. The aim of our study was to investigate the effect of moderate alcohol ingestion on gallbladder motility.

SUBJECTS AND METHODS

This is a prospective study on male non-drinkers and moderate alcohol drinkers. It was carried out between December 2005 and May 2006 in Ebonyi State, Nigeria. All the subjects gave informed consent. The protocol was approved by the Jeomedics Ultrasound Centre Research Board.

SUBJECTS

Of 33 male volunteers, 12 were excluded for obesity, and only 21 were included in the study (18 to 48 years old). Twelve volunteers were non drinkers (group A). The other nine volunteers drank alcohol less than four times a week and were considered moderate drinkers (group B). The range of alcohol consumption considered acceptable for inclusion in the study was between 60 and 180 ml of local beer containing 5.5% alcohol by volume irrespective of body weight.

Exclusion criteria were positive history of hepatobiliary diseases and hormonal or neurological disease known to affect gallbladder motility, such as diabetes¹¹ or pancreatitis¹². Obesity was an exclusion criterion because postprandial gallbladder motility is negatively correlated with body mass index (BMI). A body mass index greater than 27 kg/m² is defined as obesity¹³. Subjects with lactose intolerance were also excluded from the study.

GALLBLADDER MOTILITY (EMPTYING) MEASUREMENT

Gallbladder volumes were estimated by real-time ultrasound scanning using Sonoline SL-2 with a linear array transducer with a frequency of 3.5 MHz. After visualizing the largest gallbladder longitudinal outline, the length and largest anteroposterior diameter were measured on arrested inspiration in supine position, with calipers crossing each other at 90°. The probe was then rotated 90° to obtain the maximal transverse diameter [14].

In each volunteer, three serial standard subcostal ultrasound recordings were performed by the same investigator (A.C.) as follows:

1. before drinking 165 ml of Three-crown milk (Friesland) (contents: milk solid, vegetable oil, stabilizer and vitamins A and D₂);
2. 10 minutes after drinking the tin of milk;
3. 20 minutes postprandial.

Gallbladder volumes were obtained using volume calculation for a prolate ellipse [volume = length x width x height x 0.523]¹⁵. The gallbladder contraction index (GBCI) is the percentage postprandial decrease in gallbladder volume¹⁵. Using the fasting gallbladder volume as the initial volume, we determined the contraction index 10 and 20 min postprandial and used the mean of the two as the actual GBCI. This index was used as a measure of gallbladder motility and emptying.

STATISTICAL ANALYSIS

Volunteers were categorized as drinkers or non-drinkers. GBCI was expressed as the mean ± standard deviation. Two-tailed Student's t-test was used to compare mean values. Statistical significance was defined as P<0.05.

RESULTS

The mean GBCI ± standard deviation was 45.48% ± 17.36% and 44.92% ± 19.93% in alcohol drinkers and non-alcohol drinkers, respectively. These values were not significantly different.

DISCUSSION

The effect of alcohol on gallbladder motility has been debated. While Modaine et al [5], utilized the ingestion of Lundh meal test once with water and once with alcohol in a crossover study, we adopted a two-group design. Moderate alcohol intake is common in our locality, and so we focused on the effect of chronic moderate alcohol ingestion on gallbladder motility in males.

We observed no significant difference in the gallbladder motility between drinkers and non-drinkers. This indicates that moderate alcohol ingestion does not stimulate gallbladder motility and therefore should not be indicated for the prevention or treatment of cholelithiasis or biliary dyskinesia. However, our results are not in agreement with those of Mondaine et al., [5] and Masui et al [6]. This discrepancy is most likely due to methodologic differences, but environmental or genetic factors could also be

involved. Further investigations are needed to establish whether or not alcohol modifies gallbladder motility.

Our study has important limitations because we used cross-sectional data rather than a crossover method as adopted by Modaine et al [5]. Differences in anthropometric variables, such as age and body mass index (BMI), are correlated with gallbladder motility, and so they can affect the results. In our opinion, before determining the definitive role of alcohol on gallbladder motility, a group of volunteers should be allowed to take alcohol for some months, after which this test would be carried out with a fatty meal and water only. The same subjects should be deprived of alcohol for a specified number of months and the same procedure repeated. Also, it would be desirable to investigate the acute effect of alcohol on gallbladder motility to further understand the protective effect of alcohol against cholesterol cholelithiasis.

In conclusion, we showed that moderate intake of alcohol has no significant effect on gallbladder motility.

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