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Original article

Post-prandial paradoxical filling of gall bladder in patients with acute hepatitis: Myth or reality?

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ABSTRACT

Background: A minority of patients of acute hepatitis may exhibit edematous GB walls with no visible lumen despite fasting and may also exhibit paradoxical GB response in the post-prandial state.

Methods: Patients of acute hepatitis underwent routine upper abdominal sonography after overnight fasting. Patients who demonstrated contracted GB with edematous and coapted walls without any visible lumen despite overnight fasting were studied in the post-prandial phase after having breakfast. Serial ultrasonography was carried out at 10–15 min interval for an hour and changes in GB morphology was noted at each stage.

Results: A total of 77 patients of acute hepatitis underwent USG of hepatobiliary system between Sept 2008 and Aug 2009. Contracted gall bladder with edematous and coapted walls without any visible lumen despite overnight fasting was noted in 11 patients and were studied in the post-prandial phase. Post-prandial paradoxical filling of GB was observed in all such cases. Serial post-prandial ultrasonography demonstrated onset of filling of GB as early as 10–15 min post-prandial. Maximal GB distension was observed between 30 and 60 min. USG at 60 min post-prandial showed slight reduction in GB volume. As the GB distended in the post-prandial state, the lumen became increasingly visible with marginal reduction in wall thickening.

Conclusion: We have observed transient paradoxical filling of GB on serial USG in early post-prandial state, in a subset of patients of acute viral hepatitis who had contracted GB with coapted walls in the initial USG after overnight fasting.

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Introduction

Gall bladder (GB) abnormalities in acute viral hepatitis are well known and include subnormal volume in fasting state, variable degree of thickening of GB wall with or without sludge.^{1–4} Despite adequate fasting, a sub-group of acute hepatitis patients demonstrate extreme degree of GB wall thickening with coapted GB walls causing non-visualization of the its lumen on ultrasonography (USG). Such patients may demonstrate a paradoxical response to fatty meal, exhibiting dilatation of the GB in the post-prandial state.^{5–7} This phenomenon of post-prandial paradoxical response of GB in patients of acute hepatitis has been described by a few authors between 1995 and 1998 in the form of case reports and case series.^{5–7} However, the clinical implication and potential application of such an observation has never been discussed. We describe our experience of serial ultrasonographic changes showing transient paradoxical response of GB in the post-prandial state in a sub-group of acute viral hepatitis patients and also discuss the clinical significance and potential application of such a phenomenon in day to day practice.

Materials and methods

This is a prospective study which has been carried out at a tertiary care teaching hospital and multi-speciality zonal hospital of Indian Armed Forces. All subjects were serving personnel of Armed Forces India admitted to service hospital with a clinical diagnosis of acute viral hepatitis. Diagnosis of acute viral hepatitis was based on clinical features (short term malaise, fatigue, anorexia, jaundice etc) and laboratory evidence of deranged liver cell function (raised alanine amino transferase, ALT). All patients were studied within 7 days of onset of clinical symptoms and/or jaundice. All patients were referred to the Department of Radio-diagnosis for USG of the hepatobiliary system. Sonography was done in each case using an electronic multi-frequency (2.5–6 MHz) convex transducer (Wipro GE, LOGIQ P3 & P5) after overnight fasting for 10–12 h. The following organs were studied in detail: Liver, GB and Spleen. Presence of loco-regional lymphadenopathy, free fluid or any other significant finding was also noted. GB was studied for fasting volume, wall thickness and wall edema. A subset of patients who showed contracted GB with edematous and coapted walls with non-visualization of GB lumen despite overnight fasting were asked to report back to the radiology department 10–15 min after having his usual breakfast for serial post-prandial USG of GB. The breakfast included bread with butter/wheat-flour tortilla or pancake ('roti/puri') with mixed vegetable ('sabji') preparation and a glass of milk. The procedure was explained to each patient and their informed consent was obtained. GB volume and lumen was serially assessed at 10–15 min interval for the next 1 h. The imaging findings were recorded for subsequent analysis and future reference as hard copy and in digital format. These subsets of patients were also advised to undergo follow up USG during the recovery phase (6–8 weeks later).

Results

Between Sept 2008 and Aug 2009, a total of 77 patients underwent USG of hepatobiliary system with a clinical diagnosis of acute hepatitis. Four cases were excluded from the study because of presence of gall stones in 2 cases and ascites in 2 cases. Majority ($\approx 75\%$) of our patients were young serving soldiers (Age group 20–30 years). Variable degree of wall thickening (3–10 mm) with subnormal GB volume was found in about 80% of patients. Contracted GB with edematous and coapted walls without any visible lumen despite overnight fasting was noted in 11 (15%) patients. Serial USG studies in all these patients in the post-prandial state demonstrated that bile started filling within the GB as early as 10–15 min post-prandial and GB was maximally distended with bile at about 30–60 min post-prandial beyond which time no further distension/filling-in of GB was seen. USG done at around 60 min post-prandial showed slight reduction in the GB volumes implying thereby the onset of GB contraction, with expulsion of bile. As the GB distended in the post-prandial state, the lumen became increasingly visible with marginal reduction in wall/mucosal thickening (Figs. 1 and 2). Out of this subset of 11 cases, 9 patients underwent follow up USG in the recovery phase and all had a normally distended GB in the fasting state.

Discussion

Under physiological conditions, GB is distended with bile after overnight fasting and contracts in the post-prandial state with expulsion of bile. A contracted GB in fasting state is commonly found in cases of chronic calculus cholecystitis. A contracted GB may also be observed, in cases of acute hepatitis, without having any intrinsic GB disease. In an earlier study of 41 cases of acute hepatitis we had found 7 (17%) cases showing no visible GB lumen due to extreme wall thickening/edema despite overnight fasting⁸ David et al and Loberant et al have demonstrated paradoxical dilatation of GB in the post-prandial state in cases of acute hepatitis who initially showed contracted GB with coaptation of walls in the fasting state.^{5–7} A subset of our patients also demonstrated a relatively small volume GB with coaptation of walls due to extreme wall thickening/edema despite overnight fasting. Serial USG studies in all these cases demonstrated the paradoxical response of the GB in the initial post-prandial state. It may be mentioned here that the previous authors studied and observed a one-time post-prandial response of GB 1–3 h after meal. Serial USG studies starting from as early as 10–15 min post-prandial as has been done in our study have never been carried out by any of the previous authors. The temporal course of post-prandial events as observed in our study group was relatively earlier than previously mentioned studies.^{5–7} To the best of our knowledge, no study has been carried out with serial USGs in the early post-prandial phase in such patients.

Hepatitis is traditionally diagnosed clinically, supported with laboratory findings of deranged liver cell function.

Fig. 1 – (a–d): Serial ultrasonographic changes of GB in a patient of acute hepatitis. Note, contracted GB with thickened, edematous and coapted walls with no visible lumen in fasting state (a). The 10 min post-prandial (PP) image (b) shows starting of filling-in of bile. GB is maximally distended in the 30 min post-prandial image (c). The 45 min image (d) shows slight reduction in the GB volume with associated change in the shape.

Fig. 2 – (a–d): Serial (fasting, 20, 45 & 60 min PP) ultrasonographic changes of GB in a different patient of acute hepatitis showing similar findings as noted in [Fig. 1](#). Abbreviations used: PP, Post-prandial.

However, there is nearly always a variable degree of prodromal phase in which a patient may not show clinically detectable jaundice and may exhibit non-specific features such as weakness, lethargy, fever, anorexia, vomiting, pain abdomen etc. Pending the diagnosis of hepatitis, a patient may get treatment with potentially hepatotoxic drugs like paracetamol, which is commonly used either in isolation or in combination with other analgesic agents for symptoms like bodyache, fever etc. Such a patient may also be referred for USG evaluation of the upper abdomen. We hypothesize that if such a patient shows isolated finding of non-visualization of GB lumen with coapted walls in the fasting state (with no other detectable abdominal pathology) and demonstrates paradoxical filling of the GB lumen in the post-prandial state, as has been observed in our select study group, majority of these patients would turn out to be cases of acute hepatitis on subsequent evaluations. We have an ongoing study to assess if contracted GB in fasting patients and subsequent post-prandial paradoxical response in such patients could be used as a sonographic marker for hepatitis in clinically equivocal cases, especially in the prodromal phase. The preliminary experience is encouraging.

GB wall thickening in acute hepatitis is well known and can be a part of viral pericholecystitis.⁹ Such a finding is not uncommon in day to day radiology practice. Familiarity with such sonographic findings of acute hepatitis is extremely important as the GB wall thickening along with pain right hypochondrium, if present, may be easily mistaken for more serious conditions like acalculous cholecystitis.^{10,11} Subnormal fasting GB volume in patients of acute hepatitis can be explained on the basis of impaired hepatic function with reduced secretion of bile.⁴ Mechanism of post-prandial paradoxical response of GB in cases of acute hepatitis is not fully understood. However, it is possible that presence of food in the stomach and duodenum acts a stimulus for bile secretion by the diseased liver. Bile surge in response to food allows excess bile to make its way into the GB by displacing the apposed edematous GB walls. This may be a possible mechanism of the post-prandial paradoxical response of the GB in acute hepatitis as has been observed in our study group. However, further patho-physiological studies are needed in this subject to clearly understand the GB kinetics in cases of acute hepatitis.

Our initial experience being reported in this study has been encouraging. Sonographic findings as described above may be used to alert a clinician to consider a diagnosis of acute hepatitis in the preclinical phase and request for appropriate tests for confirmation of the diagnosis, and thus benefit the patient by avoiding potentially hepatotoxic medications. Our experience, though small in this regard, is nevertheless significant. A multi-center prospective study and data analysis of this inexpensive technique is recommended to further validate this hypothesis.

Conclusion

We have observed transient paradoxical filling of GB on serial USG in early post-prandial state, in a subset of patients of acute viral hepatitis who had contracted GB with coapted walls in the initial USG after overnight fasting.

Intellectual contribution of authors

Study concept: Col Jyotindu Debnath, Col Raju A George.

Drafting and manuscript revision: Col Jyotindu Debnath, Col Raju A George, Col Debabrata Banerjee.

Statistical analysis: Lt Col Ankit Mathur.

Study supervision: Col Lovleen Satija, Col Siddhartha Mishra.

Conflicts of interest

All authors have none to declare.

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