Fatty meal ultrasonography in chronic acalculous cholecystitis

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Received 18 September 2014; accepted 15 October 2014

INTRODUCTION

Chronic acalculous cholecystitis (CAC) is a disorder characterized by biliary colic symptoms such as right upper quadrant abdominal pain, nausea and vomiting in the absence of calculi. It may also be known as biliary dyskinesia or functional gallbladder (GB) disease [1]. Symptoms arise from motility alteration in the GB [2]. Liver function tests are typically unremarkable, and ultrasound scanning (USS) shows no evidence of calculi [3]. Computerized tomography and magnetic resonance pancreatography also tend to show the absence of duct dilatation or cause for the symptomology. The epidemiology is largely unknown, but in the USA 7.6% of men and 20.7% of women presenting with biliary symptoms have a normal USS [2]. The only commonly used diagnostic investigation is cholescintigraphy. From this, only the GB ejection fraction (GBEF) has been found to be consistently reliable as an indicator of GB dysmotility and therefore the likelihood of symptomatic relief following cholecystectomy [1]. Cholescintigraphy may be supplemented with a fatty meal challenge or a cholecystokinin (CCK) analogue with GBEFs varying depending on the supplement. One study using a fatty meal (11.4 g of fat) found ‘normal’ GBEF to be >33% [4]. Studies using CCK analogues such as cinacalcet have found differences in ‘normal’ GBEF depending on the amount and rate of infusion, but the cut-off for ‘normal’ appears to range between 30 and 40%. The current guidelines recommend 38% as the cut-off mark [5]. There is no evidence of GBEF being calculated using (USS) except for one study involving children with suspected CAC, where it was used to decide whether patients should undergo cholescintigraphy. In that study, average GBEF in patients with symptoms of biliary disease was 7.8 ± 1.8% [6].

CASE REPORT

Over a period of 7 years from 2007 to 2014, a total of 28 patients underwent a ‘fatty meal ultrasound’ (FMU) at Hillingdon Hospital, London. All presented with typical biliary symptoms but had bloods and imaging that were within normal limits, and if not were not serious enough to indicate a cause for the symptoms. Their ages ranged from 17 to 78 years with a median age of 44 years. Six (21%) of the patients were male, and the remaining (79%) were female. These patients first underwent a normal USS during which resting GB volume was established. The patients were then
given an identical brand of chocolate bar, containing 16 g fat, 21.3 g carbohydrate, 1022 kJ energy and 1.8 g protein. Forty-five minutes later they underwent a repeat USS to determine GB volume. GBEF was calculated by dividing post-prandial GB volume by preprandial volume. This was done by one consultant radiologist to reduce subjective variance.

Results for all 28 patients are summarized in Table 1. Seven (25%) patients were found to have reduced GBEF (defined as <38%). Of these, two (7.1%) went on to have a cholecystectomy, of which both demonstrated chronic cholecystitis histologically (Table 2). One of these patients was also treated for Helicobacter pylori infection at a similar time to the cholecystectomy. Both patients noted substantial symptomatic relief postoperatively.

Of the remainder, one patient was referred to gastroenterology with irritable bowel syndrome (IBS), another patient was diagnosed with chronic pain and then lost to follow-up, in one patient a cholecystectomy was not deemed to be justified by the consultant and an abdominal divarification was later found which may have accounted for their symptoms. Another patient had deranged liver function tests the next day which was diagnosed as pancreatitis, and a further had no diagnosis but was lost to follow-up.

Of 28 patients, 5 (18%) cholecystectomies were performed (see Table 3 for their outcomes). Two of these feature in the above group of patients with reduced GBEFs. The rest had ‘normal’ GBEFs ranging from 64 to 74%. GBs of all five patients demonstrated signs of chronic inflammation histologically. Four of these patients had significant symptomatic improvement postoperatively, with the fifth patient lost to follow-up.

DISCUSSION

There was no universal guidance governing the use of the results of the FMU at THH, understandably so, given that it was a novel imaging method. However, this means that interpretation of results is difficult. Of the seven patients with reduced GBEFs, only two underwent cholecystectomy, whereas it appears that four more could have benefitted although this is of course difficult to judge without seeing the patients. This is especially the case with the two patients who were labelled with IBS and chronic pain.

Interpretation of results is further hampered by all the cholecystectomies showing chronically inflamed GBs, despite some of these patients having normal GBEFs. This indicates that the FMU has poor sensitivity.
Another limitation is the low number of patients involved in this series. The most likely reason for this is clinicians being unaware of the availability of the FMU and its diagnostic use.

Given that both of the patients who underwent cholecystectomy had histological evidence of cholecystitis, this case series demonstrated a role for FMU in the diagnosis of CAC. However, the accuracy of the test is severely affected by the number of false negatives. This could, however, be balanced by the unknown number of positives in patients with reduced GBEFs who did not have cholecystectomy performed.

Further studies for validation would involve trialling the FMU more widely across a population of patients with symptoms typical of CAC with otherwise normal investigations. Ideally, suitable study patients would undergo cholecintigraphy at a similar time so that the accuracy of the two imaging modalities could be compared. Moreover, there would be consensus among clinicians requesting the FMU regarding the use of the results when patients would be referred for cholecystectomy.

**AUTHORS’ CONTRIBUTION**

R.K. conceived the idea of fatty GB USS and carried out all the scans. A.D. analysed and interpreted the patient data regarding the symptoms and investigations of the patient cohort. All authors read and approved the final manuscript.

**ACKNOWLEDGEMENTS**

We thank Dr Kapil Sugand for editing the manuscript.

**CONFLICT OF INTEREST STATEMENT**

None declared.

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