Prophylactic cholecystectomy in short bowel syndrome: Is it being utilized?

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A R T I C L E   I N F O

Article history:
Received 11 January 2018
Received in revised form 4 April 2018
Accepted 9 April 2018

Keywords:
Short bowel syndrome
Cholecystectomy

A B S T R A C T

Introduction: Cholelithiasis is common in patients with short bowel syndrome (SBS). Prophylactic cholecystectomy (PC) of the non-diseased gallbladder has been recommended in SBS patients when laparotomy is being undertaken for other reasons. Our aim was to determine if PC is being utilized.

Methods: 500 adults with SBS were seen over a 25 year period. 215 undergoing cholecystectomy prior to SBS were excluded, leaving 285 patients for evaluation.

Results: 151 (53%) SBS patients underwent a subsequent laparotomy. 77 underwent cholecystectomy for cholelithiasis at the 1st opportunity. 27 patients underwent a PC at the 1st opportunity. 47 patients did not undergo PC at the 1st opportunity. 17 (36%) of these 47 patients subsequently developed cholelithiasis with 7 undergoing cholecystectomy. Age, gender, diagnosis and initial BMI and need for longterm parenteral nutrition were similar in patients who had PC or did not. PC patients were more likely to have intestinal remnant length <60 cm (59% vs 21%, p < .05).

Conclusions: Overall 10% of SBS patients underwent PC. However, only 36% of eligible patients undergoing laparotomy had a PC.

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Introduction

More than one third of patients with short bowel syndrome (SBS) develop cholelithiasis during the course of their disease, usually within the first 2 years after resection.1–3 Previous studies suggest that SBS patients are at increased risk for developing cholelithiasis if the intestinal remnant is less than 120 cm, the terminal ileum is resected, and long-term parenteral nutrition (PN) is required.4 Furthermore, cholelithiasis appears to lead to complications more frequently in SBS patients compared to the general population and requires more complicated surgical treatment.1–5 Thus, prophylactic cholecystectomy of the non-diseased gallbladder has previously been recommended in SBS patients when laparotomy is being undertaken for other reasons.1–5 However, patient selection and timing of this procedure remain unclear.

Approximately one half of patients with SBS will undergo subsequent laparotomy.1 Prophylactic cholecystectomy is a reasonable consideration if it can be performed safely and does not have unintended consequences to SBS patients. However, SBS patients often have multiple previous operations and may require emergent procedures. Thus, prophylactic cholecystectomy may not be advisable in some patients. Any potential effects of cholecystectomy on intestinal function remain largely unstudied in the SBS population. We found that cholecystectomy after the development of SBS increased the odds of developing fibrosis/cirrhosis by two fold compared to no cholecystectomy.7 Our aim was to determine whether prophylactic cholecystectomy is being utilized in SBS patients.

Methods

This was a retrospective of review of 500 adult (>19 years old) patients with SBS evaluated at our institution between 1990 and 2016 with a minimum follow up of 12 months from development of SBS. 215 (43%) underwent cholecystectomy prior to developing SBS and were excluded from further study. SBS was defined as an intestinal remnant <180 cm in length with associated malabsorption. Intestinal anatomy was classified as Type 1 (end jejunostomy), Type 2 (jejunocolic anastomosis) and Type 3 (jejuno-ileocolic...
anastomosis). Patients under our management were treated with a consistent diet based on intestinal anatomy and had a similar parenteral nutrition (PN) weaning protocol. Patient age and gender, underlying cause of resection, status of the intestinal remnant and colon, status of the gallbladder and nutritional management and outcome were determined. Chronic parenteral nutrition (PN) was defined as continued requirement for PN > 1 year after developing SBS. Data were analyzed with the chi square test, with $P < .05$ for significance levels.

**Results**

Two hundred and eighty-five patients had an intact gallbladder (Fig. 1). 151 (53%) of the 285 patients underwent a subsequent laparotomy providing an opportunity for cholecystectomy. 77 underwent cholecystectomy for cholelithiasis at the 1st opportunity. 27 patients underwent prophylactic cholecystectomy at the 1st opportunity. There are no complications attributable to prophylactic cholecystectomy. Forty-seven patients had undergone an

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**Figure 1**

SBS Patients

$n = 500$

Cholecystectomy prior to SBS

$\rightarrow$

Gallbladder present

$n = 285$

$n = 215$

Subsequent laparotomy

$n = 151$

Cholecystectomy for cholelithiasis at 1st opportunity

$n = 77$

Prophylactic

$n = 27$

Laparotomy

$n = 47$

No Cholecystectomy

$n = 47$

No laparotomy

$n = 134$

Cholecystectomy

$n = 77$

Subsequent Cholecystectomy

$n = 7$

Fig. 1. SBS patients.
abdominal operation without prophylactic cholecystectomy. 17 (36%) of these 47 patients subsequently developed cholelithiasis and seven have undergone cholecystectomy.

We compared the 27 patients undergoing prophylactic cholecystectomy with the 47 patients undergoing laparotomy without cholecystectomy. The two groups were similar with respect to age, gender and diagnosis leading to SBS (Table 1). The abdominal operations performed were also similar (Table 2). Prophylactic cholecystectomy patients were more likely to have intestinal remnant length < 60 cm (59% vs 21%, < 0.05) (Table 3). Anatomy type was similar (Table 3), in the two groups. However, need for long term PN was similar (78% vs 74%) (Table 4).

There were several patient risk factors present in patients not undergoing cholecystectomy. 6 (13%) of 47 patients not undergoing prophylactic colectomy died within 12 months of the opportunity. 5 (11%) other patients developed end stage liver disease in that same period. Four patients were undergoing transplant procedures. There were 3 emergent laparotomies in this group.

**Discussion**

In the present study of those patients with the gallbladder present at the time of developing SBS, 10% underwent prophylactic cholecystectomy, 32% underwent cholecystectomy for disease, and 58% retained the gallbladder. Similarly, Lawinski et al. recently evaluated cholelithiasis in SBS patients. They found that 6% underwent prophylactic cholecystectomy, 23% had asymptomatic cholelithiasis, 14% required cholecystectomy for symptoms and 58% had no sign of cholelithiasis. Dray et al. performed prophylactic cholecystectomy in 9% of long term PN patients. Thus, overall the rate of utilization of prophylactic cholecystectomy is similar at various centers.

We previously recommended that SBS patients undergo prophylactic cholecystectomy when the risk of developing cholelithiasis exceeds 40% as decision analysis suggests that this group of patients would have improved survival with prophylactic cholecystectomy. This risk of cholelithiasis would be predicted by factors such as intestinal remnant length less than 120 cm, need for long term PN, resection of the ileocolonic junction, and the presence of Crohn’s disease. In the present study 36% of patients not undergoing prophylactic cholecystectomy subsequently developed cholelithiasis during follow up. These patients not undergoing prophylactic cholecystectomy included 11% with Crohn’s disease, 53% with remnant length less than 120 cm, 88% with loss of the ileocolonic junction and 74% with need for PN greater than 1 year. Thus, the majority of this patient group would have been predicted to benefit from prophylactic cholecystectomy.

We found that only 36% of patients undergoing laparotomy with a non-diseased gallbladder present underwent prophylactic cholecystectomy. One weakness of the present study is that we do not know in all patients why prophylactic cholecystectomy was not performed when the opportunity occurred. Technical issues, the patient’s clinical stability, and a short anticipated survival are all potential factors. Four patients underwent intestinal or kidney transplant procedures so technical factors might have influenced the decision. Three patients were undergoing emergent procedures. We feel prophylactic cholecystectomy should be considered if anticipated patient survival exceeds 6–12 months as the risk of cholelithiasis increases from 6% at 6 months to 20% at 12 months. One fourth of our patient’s not undergoing prophylactic cholecystectomy either died or developed end stage liver disease within one year. 20% had an underlying malignancy or history of radiation treatment. This suggests that patient condition was a factor in not performing cholecystectomy in almost 40% of these patients.
The effect of cholecystectomy on intestinal function in patients with SBS has not been evaluated. Cholecystectomy is frequently performed for biliary disease in the general population and usually has minimal apparent impact on the patient. Bile acid (BA) pool size and synthesis remain unchanged if gastrointestinal anatomy is otherwise normal. However, the BA pool circulates faster, increasing the exposure of both the enterohepatic organs and peripheral tissues to higher flux of BA.9 This may influence serum levels of BA. Clinically cholecystectomy may result in at least transient diarrhea but the occurrence of severe, ongoing diarrhea is debated.12

The current understanding of gallbladder function suggests that it has several important roles.15,16 The gallbladder interacts with the liver and intestine to maintain homeostasis of triglycerides, fatty acids, bile acids (BA), and cholesterol. Motor function of the gallbladder regulates daily cycling of BA in the enterohepatic circulation. More recently, it has been revealed that BA are signaling molecules that regulate several systemic metabolic functions.15 BA are ligands of the nuclear receptor farnesoid X receptor (FXR) and G protein coupled BA receptor TGR5, which is expressed in the plasma membranes of enteroendocrine L cells, cholangiocytes and gallbladder epithelial cells. Both FXR and TGR5 regulate lipid, glucose and energy metabolism.15 Thus, cholecystectomy might influence metabolic function in SBS patients and this deserves further evaluation.

Recent investigations have suggested a relationship between cholecystectomy and liver disease.6,17,18 We found that cholecystectomy, either prior to developing SBS or after, was associated with a higher incidence of fibrosis and/or cirrhosis but no difference in the presence of a fatty liver or the subsequent development of ESLD compared to patients retaining their gallbladder.15 In a population-based study, Ruhl and Everhart17 found that the prevalence of NAFLD was associated with prior cholecystectomy and not cholelithiasis alone, suggesting the loss of the gallbladder played an important role. In a similar study of patients with cirrhosis, cholecystectomy was a stronger predictor of the development of cirrhosis and elevated serum enzymes than cholelithiasis alone.18

Overall 10% of SBS patients in the present study underwent prophylactic cholecystectomy which is similar to other centers. Only 36% of eligible patients undergoing laparotomy had a prophylactic cholecystectomy. 40% of patients not undergoing prophylactic cholecystectomy had technical factors or underlying conditions present which influenced this decision. Our practice remains to consider prophylactic cholecystectomy in SBS patients with anticipated risk of cholelithiasis of 40% unless patient factors make this inadvisable. The effect of cholecystectomy on intestinal function and hepatic disease in SBS patients’ needs further evaluation.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.amjsurg.2018.04.002.

References

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