

Post-cholecystectomy symptoms were caused by persistence of a functional gastrointestinal disorder

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METHODS: One hundred and fifty three patients with a clinical and ultrasonographic diagnosis of gallstones filled out a structured questionnaire on abdominal pain symptoms and functional gastrointestinal disorder (FGID) before and at six months after cholecystectomy. Symptom frequency groups (SFG) were categorized according to frequency of pain attacks. According to certain pain characteristics in gallstone patients, a gallstone symptom score was accorded on a scale from one to ten. A visual analogue scale was used to quantify pain. Operative specimens were examined for size and magnitude of stone contents as well as presence of bacteria. Follow-up took place after six months with either a consultation or via a mailed questionnaire. Results were compared with those obtained pre-operatively to describe and analyze symptomatic outcome.

RESULTS: SFG groups were categorized as severe (24.2%), moderate (38.6%) and mild (22.2%) attack frequency, and a chronic pain condition (15%). Pain was cured or improved in about 90% of patients and two-thirds of patients obtained complete symptom relief. Patients with the most frequent pain episodes were less likely to obtain symptom relief. FGID was present in 88% of patients pre-operatively and in 57% post-operatively ($P = 0.244$). Those that became asymptomatic or improved with regard to pain also had most relief from FGID ($P = 0.001$). No pre-operative FGID meant almost complete cure.

CONCLUSION: Only one third of patients with FGID experienced postoperative relief, indicating that FGID was a dominant cause of post-cholecystectomy symptoms.

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Abstract

AIM: To classify gallstone disease as a basis for assessment of post-cholecystectomy symptoms.

Key words: Gallstone symptoms; Functional gastrointestinal disease; Cholecystectomy; Post-cholecystectomy symptoms

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INTRODUCTION

It is commonly accepted that removal of the gallbladder is the best treatment for symptomatic gallstone disease. However, less focus has been on patient selection and typical or common symptoms of this disease in order to understand prevailing symptoms after surgery^[1-4]. Although disease severity has been used^[5-7], these efforts have not been united into useful and widely accepted working terms for preoperative clinical use and outcome assessment. As a consequence, the indication for cholecystectomy is sometimes vague and assessment of outcome suffers accordingly^[8].

Pain is a key element in gallstone symptoms but pain is a general symptom. Therefore pain characteristics and additional symptoms reported in classical descriptions of the disease has expanded the interpretation^[9-11]. Functional gastrointestinal disorder (FGID) is quite common in the population and the two diseases often appear together^[12]. FGID may go away or appear more distinct to the patient after cholecystectomy and thus distort the sense of postoperative relief. Up to 30% of patients have some symptoms following cholecystectomy^[13,14]. No consistent physiological substrate for such pain has been documented^[2]. It is somewhat unclear to what degree post-cholecystectomy symptoms resemble the exact symptoms before removal of the gallbladder^[13]. Most studies are retrospective with follow-up periods commonly ranging from a few weeks to a couple of years^[6,14,15]. A recent, prospective study lacked clinically useful working terms with a mixture of both pain associated symptoms and FGID^[3].

Our aim was to categorize gallstone disease according to the severity of clinical symptoms, pain characteristics, and quantify FGID to define postoperative outcome in terms of new or persistent symptoms.

MATERIALS AND METHODS

One hundred and fifty-three patients with an ultrasonographic diagnosis of gallstones admitted for elective laparoscopic treatment of symptomatic, uncomplicated gallstone disease in a Norwegian ($n = 100$) and a US ($n = 53$) institution.

Questionnaire

The patients filled out a structured questionnaire on pain

characteristics and functional abdominal symptoms before and at six months after surgery. The questionnaire was assembled after a large experience with pre-operative interviews in two randomized trials and modeled as a simplified version of the Rome II questionnaire^[16,17]. Symptoms were classified according to appearance ranging from never to almost always in four steps: never, occasionally, very often, and almost always. Only those symptoms that were present more than 50% of the time (i.e. the last two) was counted as a positive answer (Table 1).

Follow-up was conducted at the outpatient clinic for all Norwegian patients at six months at which time the questionnaire was filled out. The American patients were mailed the questionnaire for logistic reasons.

Gallstone pain attacks were categorized as symptom frequency groups (SFG) according to the frequency experienced during the last three months. Patients that were unable to define exact time periods for pain attacks or had a dominant pattern of ubiquitous pain or had symptoms dominated by severe nausea or food intolerance were classified as a chronic symptom group.

A visual analogue scale score (VAS) was used to quantify the severity of pain in the symptom questionnaire. A 100 mm long horizontal line was to be marked vertically at the point consistent with the pain experienced by the patient. The left end was marked "No pain" and the right end "Unbearable pain".

Gallstone symptom score

According to certain pain characteristics in gallstone patients, a Gallstone symptom score (GSS) was accorded from 1 to 10 (Tables 2 and 3).

In our practice, patients were found to have symptomatic, uncomplicated gallstone disease if ultrasonography detected gallbladder stones and the patients had relevant clinical symptoms. Endoscopy was neither a routine part of the pre-operative work-up nor planned as a diagnostic aid in case of persistent symptoms.

Pathology

Operative specimens were prepared for examination of bacterial contents, stone size and routine histology on the back table immediately after the operation finished.

Bile was aspirated with a syringe from the gallbladder and sent for culture together with a piece of the wall. Stone size was measured with a caliper after the gallbladder had been opened on the back table. Finally the specimen was put on formalin and sent to the pathologist for routine (hematoxylin and eosin) staining and histological assessment.

Ethics

The Regional Ethical Committee of Western Norway and The National Data Inspectorate approved the study. The Institutional Review Board (IRB) of Cleveland Clinic approved the study (IRB 7000/04). The study was registered with clinicaltrials.gov as part of NCT01190280.

Table 1 Assessment of functional abdominal symptoms (functional gastrointestinal disorder)

Perspiration
Intolerance to food
Acid regurgitation
Heartburn
Difficulty swallowing, food sticking in the lower esophagus
Nausea
Loss of appetite (anorexia)
Feeling full after eating very little (early satiety)
Feeling of abdominal fullness or bloating
Abdominal distension, which requires loosening of the belt
Frequent loose bowel movements (or more often than usual)
Constipation (or less bowel movements than usual)
Alternating constipation and loose bowel movements
Difficulty passing stools with straining, urgency or feeling of incomplete evacuation
Abdominal pain or discomfort is relieved by bowel movements (passing of stool)

Rate the frequency of the following symptoms associated with abdominal pain during the last 3 mo or longer, using the following scale: 0: Not at all or rarely (less than 10% of the episodes); 1: Occasionally (less than 50% of the episodes); 2: Very often (more than 50% of the episodes); 3: Almost always (more than 80% of the episodes).

Statistical analysis

The χ^2 test was used to compare the level of improvement between groups, and to compare the presence of FGID between patients with different symptom alleviation before and after operation. Logistic regression for dependent paired data was used to analyze the difference in FGID before and after surgery between different GSS-groups. The statistical software used was PASW Statistics version 18.0 and Intercooled Stata 9.2 for Macintosh.

RESULTS

The patient demographics are shown in Table 4.

Symptom frequency groups and visual analogue scale score

Four SFG were categorized according to frequency of pain attacks: severe (24.2%): ≥ 1 pain attack per week, moderate (38.6%): ≤ 3 pain attacks per month, mild (22.2% of the patients): ≤ 2 pain attacks per 3 months, or chronic pain condition (15%): no discernable pain attack pattern.

The VAS was equally distributed between all patients, mean VAS preoperatively was 82.8 with variation from 17 to 100 (Table 5).

Gallstone symptom score

Mean preoperative GSS in pair-wise comparisons showed a significant difference preoperative between chronic and moderate disease patients ($P = 0.022$). There was a non-significant trend towards a greater rate of cure or symptom relief measured with GSS among patients with less severe disease ($P = 0.651$). Patients in the most severe SFG had the highest GSS and experienced more remaining symptoms, for details see Tables 5 and 6.

Table 2 Assessment of pain symptoms

Had an abdominal pain attack at least once for the last 3 mo or longer?
Experienced either pain or discomfort in the abdomen of a continuous steady nature at least once per week for the last 3 mo or longer?
For women: Did the onset of pain begin during pregnancy or soon after pregnancy?
Evaluated in the Emergency Department or seek medical attention for the abdominal pain?
Admitted to the hospital for the abdominal pain?
Estimate how often pain medications are required for the pain:
Not at all or rarely (less than 10% of the episodes)
Occasionally (less than 50% of the episodes)
Very often (more than 50% of the episodes)
Almost always (more than 80% of the episodes)
Time-interval during which the pain most often occurs:
7 am - 12 pm
12 pm - 6 pm
6 pm - 11 pm
11 pm - 7 am
Highly variable and unable to predict time of onset
Rate how often the pain occurs in the following abdominal areas:
Right upper quadrant ¹
Left upper quadrant ¹
Right lower quadrant ¹
Left lower quadrant ¹
Midline or center of the upper abdomen ¹
Is there often an area where the pain is strongest (able to point with one or two fingers):
Right upper quadrant
Left upper quadrant
Right lower quadrant
Left lower quadrant
Midline or center of the upper abdomen
Highly variable and unable to predict one area
No
Experience discomfort in the right upper quadrant when bending forward?
Abdominal pain radiates from where it started?
If yes, where does it radiate most often?
Right upper back beneath the right shoulder blade
Upper back between the shoulder blades
Lower back
None of these places mentioned
Highly variable and unable to predict a dominant area
Estimate the number of pain attacks over the last 3 mo
Estimate the usual duration of a pain attack in hours and minutes
Experience urge to move around during a pain attack ¹
Choose one of four patterns describing pain attacks (depicted by graphs):
Low-grade warning pain followed by a steady rise to a maximal constant pain, gradually getting better after a while
Low-grade warning pain followed by a steady rise to a maximal degree with occasional waves of pain, gradually getting better after a while
Pain begins suddenly with maximal intensity and improves over time
Pain begins suddenly with maximal intensity and persists with waves of pain until it goes away
Rate level of maximal pain intensity by 100 mm visual analogue scale score-scale

Pain attacks are defined as suddenly appearing pain that is distinct from, and stronger than any continuous, steady pain or discomfort. ¹The pain occurrence in each area is rated as: not at all or rarely (less than 10% of the episodes), occasionally (less than 50% of the episodes), very often (more than 50% of the episodes) or almost always (more than 80% of the episodes).

Functional gastrointestinal disorder symptoms

A FGID was present in 87.6% before surgery and in 57.6%

Table 3 Assignment of a clinical gallstone symptom score to different preoperative symptom frequency groups (%)

Symptom	Score	Percent of patients with symptoms according to pain presentation			
		Severe	Moderate	Mild	Chronic
Pain in upper abdomen: Pain most common in right upper quadrant or intensifies when bending forward or lying on the right side	2	100	96.6	94.1	88.2
Pain attacks commonly last more than one hour	1	73.0	66.7	76.5	46.2
Pain in a "plateau fashion"	1	62.2	72.9	67.6	64.3
Urge to move during pain attacks	1	51.4	69.0	58.8	84.6
Pain commonly occurs at night	1	43.2	61.0	50.0	29.4
Pain radiation to the back	1	40.5	47.5	38.2	58.8
Nausea during pain attacks	1	61.1	48.3	52.9	50.0
Use of analgesics in > 50% of pain attacks	1	54.0	54.3	44.1	41.2
Perspiration during pain attacks	1	36.1	41.4	41.2	60.0

Table 4 Demographics of the study population of 153 patients and 115 follow-up responders *n* (%), mean age (range, yr)

Symptom frequency group	Females	Males	Total
All groups	122 (79.7), 47 (17-81)	31 (20.3), 51 (28-85)	153 (100), 48 (17-85)
Severe disease	31, 45 (17-81)	6, 44 (25-64)	37 (24.2), 45 (17-81)
Moderate disease	47, 44 (20-72)	12, 53 (39-70)	59 (38.6), 46 (20-72)
Mild disease	26, 53 (25-78)	8, 52 (34-85)	34 (22.2), 53 (25-85)
Chronic disease	18, 53 (23-81)	5, 55 (30-80)	23 (15.0), 54 (23-81)
Responders to follow-up	89 (77.4), 49 (20-81)	26 (22.6), 52 (25-85)	115 (75.2), 50 (20-85)

χ^2 for gender; $P = 0.889$.

Table 5 Changes in gallstone severity score by symptom frequency group in 115 responding patients from the study population of 153 patients *n* (%)

Preoperative SFG	Patients	Preoperative		Responders	Postoperative		mean % reduction in GSS
		mean GSS	mean VAS		mean GSS	mean VAS	
Severe disease	37 (24.2)	6.11	81.1	29 (78.4)	1.76	33.0	69.1
Moderate disease	59 (38.6)	6.47	86.6	41 (69.5)	1.32	15.8	78.7
Mild disease	34 (22.2)	6.09	81.3	26 (76.5)	1.04	12.8	87.0
Chronic disease	23 (15.0)	4.35	76.8	19 (82.6)	1.00	8.9	62.7

SFG: Symptom frequency groups; GSS: Gallstone symptom score; VAS: Visual analogue scale score.

at follow-up after surgery. No difference was seen between the different SFG ($P = 0.244$). There was a trend that patients with FGID before surgery were less likely to experience improvement of their pain or complete relief. Likewise, patients without FGID after surgery were more likely to report improvement or complete relief of pain (Table 7).

Gallbladder specimen examination

Histology of the gallbladder showed that 85% had chronic and 10% subacute inflammation while 5% were normal. Bacteriological examination in 79 patients discovered bacteria in 12 (15.2%) without difference between the groups. The distribution of bacteria was: gram-negatives 3.8%, gram-positive cocci 8.9%, and mixed cultures 2.5%. Stone type was not examined.

The number of stones was measured in 66 patients and size in 64 patients. The mean number was 2.5 (range 1-9) with variation between SFG from 2.3 to 2.8. The

stone size was mean 13 mm (range 1-40) with variation between groups from 12.5 to 13.2 mm. There were no statistically significant differences between the groups.

DISCUSSION

Gallstone symptoms are still classified simply as biliary colic long after a variety of pain characteristics have been described for these pain attacks^[9,10]. Thus, studies of outcome of gallstone disease are usually hampered by lack of scientifically acceptable definitions and designs^[3,5,6,16]. This includes an inadequate definition of gallstone symptoms, lack of proper recognition of FGID as a concomitant complaint, prospective design and defined follow-up methods. Freedom of pain attacks is a major outcome measure after cholecystectomy. Complete cure of a biliary type pain in contrast to a persisting dull aching pain, has been reported as a reasonable goal for surgery^[18]. Previous studies have reported that so-called

Table 6 Symptomatic improvement in 115 patients after cholecystectomy *n* (%)

	Groups			<i>P</i> value ¹
	Asymptomatic but improved	Symptomatic or worse	Unchanged	
Patients				0.651
All patients	76 (66.1)	28 (24.3)	11 (9.6)	
Severe disease	15 (51.7)	10 (34.5)	4 (13.7)	
Moderate disease	27 (65.8)	9 (22.0)	5 (12.2)	
Mild disease	20 (76.9)	5 (19.2)	1 (3.9)	
Chronic disease	14 (73.7)	4 (21.0)	1 (5.3)	
Age				0.490
< 60	54 (64.3)	23 (27.4)	7 (8.4)	
> 60	22 (71.0)	5 (16.1)	4 (12.9)	
Gender				0.573
Women	56 (62.9)	24 (27.0)	9 (10.1)	
Men	20 (76.9)	4 (15.4)	2 (7.7)	

¹*P* values from χ^2 calculation.

Table 7 Presence of pre- and post-operative functional gastrointestinal disorder in 115 patients with different *n* (%)

Presence of FGID	Patients	Asymptomatic	Symptomatic, improved	Unchanged or worse	<i>P</i> value ¹
None pre-operative	13 (11.3)	11 (84.6)	2 (15.4)	0	0.449
Present pre-operative	102 (88.7)	65 (63.7)	26 (25.5)	11 (10.8)	
None post-operative	49 (42.6)	42 (85.7)	7 (14.3)	0	0.001
Present post-operative	66 (57.4)	34 (51.5)	21 (31.8)	11 (16.7)	
Total	115 (100)	76 (66.1)	28 (24.3)	11 (9.6)	

FGID: Functional gastrointestinal disorder.¹*P* values from χ^2 calculation.

biliary colic remained in only 8%-9% of patients in contrast to non-colicky pain in 18%-32%^[13,19]. Others have found an incidence of around 20% of persistent pain of the same character as before the operation^[20,21]. Lublin and coworkers^[6] reported presence of pain in 25% and non-pain symptoms in 43%. It seems that distinct or marked pain is present in up to 4%-9%^[12,13] whereas pain or "discomfort" connected with dyspeptic symptoms are not clearly categorized^[22]. Around 25% of our patients improved without being completely cured after removal of the gallbladder. This corresponds to previous figures of 18%^[13] and the frequency of more diffuse intestinal symptoms found by others during post-operative examination^[12]. One author mentioned similar findings without giving figures but did not find interference with quality of life measurements^[23]. Up to 93% satisfaction has been reported after removal of the gallbladder^[13,15,22,24,25].

FGID consists of two main subgroups, functional dyspepsia and irritable bowel syndrome (IBS), with overlapping features making them both symptomatic of an irritable or dysfunctional gut^[26,27]. The criteria in the Rome II and the more recent Rome III questionnaire give a formal definition of FGID^[17,28]. In the West, there tends to be a female predominance. FGID appears as a real condition of gallstone disease^[3,12,22,29]. The pathological connection is still obscure but a common dysfunctional trait has been shown^[30]. A diagnostic problem arises only when gallstone disease becomes vague with regard to pain expression^[3,5,22]. Lublin and coworkers^[6] reported that 80% of patients had so-called non-pain symptoms pre-operatively

in accordance with an 88% incidence of FGID in our patients. In our practices, nearly all gallstone patients coming to surgery have upper abdominal pain either in the right upper quadrant or epigastrium although a small percentage has intolerable nausea or food intolerance that dominates over pain. FGID was therefore judged a concomitant condition in most cases. Our outcomes are quite similar to those of others who have attempted to classify pre-operative symptoms^[5,6]. It could be perceived that freedom of pain with an attack pattern was the decisive factor when cure or relief was achieved, whereas FGID of various intensities caused the bulk of the persistent symptoms, because FGID persisted in 57% of the patients. The post-operative GSS and VAS were markedly decreased and it is therefore likely that the patients were cured of the pain attacks that led to cholecystectomy. Besides, even so-called biliary colic, even if it resembles pre-operative symptoms, needs a substrate when the gallbladder has been removed. It has not been proved that this stems from the common bile duct (CBD) or the sphincter of Oddi, even though symptoms caused by CBD disease, such as a stone, may be quite similar. Therefore, we will argue that there is reasonable evidence pointing to FGID as a cause of persisting symptoms after surgery.

Some investigators have reported that patients with the most severe, frequent or bothersome pre-operative symptoms are less likely to be cured^[5,6,13,22]. The present study corroborated this as results showed that only frequency of pain attacks expressed as SFG separated the patients with regard to severity in the pre-operative evalu-

ation. GSS only separated the pain attack groups against the chronic group. This is broadly correlated with a Swedish study but differed insofar that we amalgamated what were their two most severe groups into one^[5]. Lublin and coworkers^[6] used frequency without a more specific definition. The disease may wax and wane and this may influence the response to the questionnaire^[5,5]. A minority of 15% had chronic symptoms with daily occurrence as the rule. We suspect that some of the patients with daily symptoms reported by Halldestam and coworkers^[5] might have been classified as a chronic symptom group by our definition. This would distort comparison of outcome because these two groups responded differently to operative treatment in our study. It is also difficult to ascertain the meaning of “atypical” or multiple locations of pain^[5]. Pain in the right upper quadrant or epigastrium is a core issue in the diagnosis of gallstone disease but admittedly in a small minority of patients other symptoms dominate. However, as long as these symptoms can be assigned to gallstone disease, they are not a contraindication to surgery in such cases.

Although patients with the highest pre-operative mean GSS had the largest relative score reduction, this group retained a higher post-operative score and had the highest VAS score. The reason for that was largely assumed as being caused by persistent symptoms of FGID even though this could not be established with certainty because of overlapping symptoms in gallstone patients. It was, however, consistent with the observation that the severe SFG had more patients with no relief and also had a slightly larger GSS burden and consequently higher post-operative GSS and VAS score, indicating that a larger disease burden or more symptoms was in concert with a higher VAS. This may be interpreted as more persistent pain. One study found that patients with the most bothersome symptoms before surgery had less chance of cure^[22]. The highest odds ratio for persistence was obtained by “gas/flatulence”, a common symptom of IBS or FGID. This could easily be interpreted as caused by FGID but it has been unusual to explicitly label post-cholecystectomy symptoms as FGID even though many symptoms fit this diagnosis^[22]. One explanation may be that these symptoms has for too long been discerned as part of a wider range of gallstone symptoms while we will argue that they are two concomitant disease expressions with many overlapping features making it difficult to separate them.

Compared with measurements before surgery VAS has reached levels of around 68 (of 100) pre-operatively to levels of 35 to 45 post-operatively^[13,15,19,21]. In the present study, VAS was similar across all four GSS groups and it fell after surgery to a mean of 18 (range 9 to 33). Therefore, it could not by itself be used to distinguish between the patients before or after surgery. Our post-operative median score value indicates no more than mild to moderate pain^[31].

Theoretically, a bile duct focus might cause pain quite similar to that originating in the gallbladder but only

about 2% has common bile duct stones after removal of the gallbladder^[6,13]. Psychometric testing has shown that a psychosomatic disturbance may influence outcome after cholecystectomy^[8,32]. It has been observed that women tend to have more postoperative pain^[33] while some have reported that gender is irrelevant^[15,20,34]. Women under the age of 60-years have been found to have significantly more pain of the diffuse, more continuous type that is also described in functional dyspepsia, and satisfaction has been greater for men^[15]. We found that women were less likely to become asymptomatic. Age of the patient has not influenced outcome^[20,34], whereas the opposite was found when 50 or 55-years-of-age was used as cut off value^[4,22]. In contrast to previous studies, patients more than 60-years-of-age fared slightly worse in the present study^[5,13]. Stone size and number, bacteriology, or histology^[2] did not impact the symptom presentation in this study.

We recommend a follow-up period of 6 mo before assessing outcome after cholecystectomy^[8,22]. Whether qualified personnel should interview a study object or a questionnaire be used, remains open for discussion^[8,16,22,29]. It may be a point of concern whether a self-assessment questionnaire will make the patient report more complaints than will be revealed by a professional interview^[35].

Approximately 10% of patients did not improve or even got worse whereas the condition of 25% improved and the rest was cured. Patients with the most SFG were less likely to be completely cured and this group also had a higher pre-operative symptom score (GSS). Post-operative FGID persisted in 57% of patients and indirect evidence suggests that persistent symptoms were caused mainly by FGID. The main indication for elective cholecystectomy in uncomplicated gallstone disease should be pain attacks. Patients should be informed about the chance of persistent symptoms.

COMMENTS

Background

Patients with gallstones often have various abdominal symptoms that may be caused by the gallstones or are present as a separate condition but with a common physiology. The accompanying abdominal symptoms are called functional gastrointestinal disorders (FGID). Because of its common nature and presence of pain or discomfort it is difficult to separate a functional condition from the gallstone disease itself. Lack of a clear distinction between the two and a poor understanding of the physiology that causes both conditions, especially FGID, makes it difficult to treat these symptoms if they remain after the operation. The article characterizes symptoms caused by gallstone disease in order to define which symptoms remain after removal of the gallbladder. Hope of improving understanding of their character and origin will subsequently have a potential bearing on treatment.

Research frontiers

Current treatment methods may not be satisfactory due to limited insight in physiological mechanisms. Therefore, FGID causes a major health problem with a large amount of sick-leave days. Because of this burden on both patient and society it is important to conduct proper research to gain insight in disease mechanisms and offer effective treatment.

Innovations and breakthroughs

The study tried to characterize gallstone disease according to intensity and frequency of pain attacks as well as concomitant functional symptoms. The pre-

operative condition has then been compared to persisting symptoms after surgery. Such methodical studies of the character of gallstone disease are scarce.

Applications

An understanding of disease expression may give better insight into why complete symptom relief does not occur in some patients after cholecystectomy. Thus, it may be possible in the future to decide which patients will have the greatest chance of cure as well as offer efficient treatment of persisting symptoms after cholecystectomy.

Terminology

Gallstone disease is characterized by bouts of pain or pain attacks in about 85% of patients. The rest have a combination of more consistent pain, strong food intolerance or nausea. FGID is present in about 88% of gallstone patients. This condition may have particular symptoms but a clear-cut physiologic mechanism or organic origin has not been decisively described for it. The diagnosis is sometimes made by exclusion of other diseases. It is difficult to separate clinically from gallstone disease when both are present in the same patient.

Peer review

The authors have nicely analyzed the existing preoperative functional disorder in patients of gallstones to substantiate its correlation with post-operative symptoms.

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