

# Risk Assessment in Cholelithiasis: Is Cholecystectomy Always to be Preferred?

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## Abstract

**Background** As many patients with gallstone disease do not benefit from cholecystectomy, preoperative recognition of such high-risk patients is important. The aim of the study is to identify predictors of persisting symptoms at 6 months after cholecystectomy for patients with different preoperative symptomatology.

**Method** Participants in this prospective study were consecutive patients ( $n=172$ ), age 18–65 years, with symptomatic cholelithiasis, undergoing a laparoscopic cholecystectomy. Predictors were identified using uni- and multivariate regression analyses.

**Results** At 6 months postcholecystectomy, patients with only preoperative biliary symptoms were most often free of symptoms (62.5%). Patients with only dyspeptic symptoms most often reported persistence of preexisting symptoms (63.2%). Preoperative non-specific symptoms predicted the report of postoperative biliary and/or dyspeptic symptoms (OR=4.5–6.1). Persistence of preexisting pattern of symptoms was predicted by the use of psychotropic medication (OR=5.3) and dyspeptic symptoms (OR=4.5). Postoperative biliary symptoms were predicted by High Trait Anxiety (HTA) (OR=10.6).

**Conclusion** Surgeons should take account of individual risks of patients in the management of cholelithiasis. Instead of cholecystectomy, expectative management should be the first choice in patients with non-specific symptoms, with dyspeptic symptoms only, with HTA and in patients using psychotropic medication.

**Keywords** Cholecystectomy · Cholelithiasis ·  
Outcome assessment · Risk assessment · Surgery

## Introduction

Gallstone disease (cholelithiasis) is a common condition that affects 5% to 22% of the people in Western countries.<sup>1,2</sup> Most patients are unaware of their condition<sup>3</sup> and only 10–30% of these patients develop clinical symptoms,<sup>4–7</sup> such as classical biliary colics or other gastrointestinal symptoms. Laparoscopic cholecystectomy is the golden standard in the management of uncomplicated symptomatic cholelithiasis. As cholecystectomy entails the risk of peri- and early postoperative complications (0.2–9.4%)<sup>5,8</sup> and a substantial number of patients (40.4%) report negative outcome after cholecystectomy,<sup>9,10</sup> critical consideration of pros and cons of cholecystectomy is required. Identification of potential predictors of negative outcomes is essential for decision making in elective cholecystectomy.

Clinical characteristics, such as preoperative dyspeptic symptoms,<sup>11–13</sup> medication use,<sup>10</sup> age,<sup>14,15</sup> characteristics

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of preoperative pain and symptoms<sup>12,13,15,16</sup> have been identified as associates of long- and short-term postcholecystectomy outcomes. However, the comparability of results is hampered by different criteria for inclusion, moments of follow-up, definitions and operationalisations of variables and outcomes. Besides 'hard', clinical characteristics, 'soft' predictors such as self-rated health status,<sup>13</sup> personality traits,<sup>12,17–19</sup> and other psychological variables<sup>20</sup> have been identified as predictors of negative outcomes as well. Despite the fact that the symptomatology of cholelithiasis is ambiguous and only the minority of patients report classical biliary colics,<sup>5,21</sup> preoperative symptoms (in combination with ultrasound examination) are used as a reference point for diagnosis and indication of cholecystectomy in clinical practice. Therefore, in the current study we aimed at the identification of predictors of postoperative symptoms at 6 months postcholecystectomy for patients with different preoperative symptomatology.

## Methods

### Patients

Patients for the current study were recruited from the Department of Surgery of the St. Elisabeth Hospital in Tilburg, the Netherlands. Consecutive patients (18–65 years) with diagnosed symptomatic cholelithiasis, awaiting an elective laparoscopic cholecystectomy who visited the hospital between March 2006 and January 2008, were eligible for the study. Exclusion criteria were: patients with ASA III or IV, undergoing an emergency procedure or intended open cholecystectomy, insufficient knowledge of the Dutch language, choledocholithiasis, cholangitis, known pregnancy, known liver-cirrhosis, history of abdominal malignancy, previous upper abdominal surgery (precluding laparoscopic approach) and psychiatric diseases. All patients underwent a standard surgical and anaesthetic procedure. The protocol of the study was approved by the local ethics committee.

### Procedure

Preoperatively, participation was asked during the patients' first surgical consultation at the outpatient clinic. The surgeon introduced the study, whereas subsequently nurses informed patients about the research procedures. Patients received the first set of questionnaires, which also contained written information about the study, and signed informed consent. Medical history and comorbidities were obtained from medical records. Patients completed and returned the first questionnaires before admission for cholecystectomy. If necessary, patients received a

reminder telephone call to return the questionnaires 3 to 5 days before the operation. Patients who returned the questionnaires after admission were excluded from the study. At 6 months after cholecystectomy, patients received the same questionnaire which could be returned in a prepaid envelope. If needed, patients were contacted by telephone twice, usually 2 and 4 weeks after sending the questionnaires. Patients returning their second questionnaire >9 months after surgery were considered as non-responders.

### Questionnaires

The demographic questionnaire was completed preoperatively and asked about sex, age, marital status, educational level and work. Preoperatively and at 6 months postcholecystectomy, patients completed a symptom checklist based on information from focus groups of gallstone patients.<sup>22</sup> Patients should tick off whether they experienced biliary symptoms (upper abdominal pain, nausea, vomiting), dyspeptic symptoms (bad taste, heartburn, under abdominal pain, diarrhoea and flatulence) and non-specific symptoms (general malaise, fatigue, weight change, decrease in sexual functioning and health complaints not mentioned in the predefined checklist) in the past week. Symptoms were categorised according to a study of Weinert et al.,<sup>13</sup> that was based on the Minnesota Clinical Comparative Assessment Project database.<sup>23</sup> Furthermore, patients indicated the nature, severity, duration and frequency of pain during preoperative biliary attacks on a 100-mm visual analogue scale and on three multiple choice items. All included patients had experienced biliary or dyspeptic symptoms in medical history. After surgery, surgical reports were checked for the presence of gallstones/sludge and conversion to open surgery.

Patients completed the trait scale of the State-Trait Anxiety Inventory (STAI) preoperatively. The STAI-trait exists of 20 items with a 4-item Likert scale reflecting the extent of anxiety patients generally feel. The STAI-Trait Anxiety measure has good 3 months test-retest reliability ( $r=.75$ ) and internal consistency (Cronbach's  $\alpha=.84-.92$ ).<sup>24</sup> Patients scoring the 80th percentile or higher were indicated as patients with 'High Trait Anxiety' (HTA), whereas patients with a score below the 80th percentile were indicated as patients with 'Non-High Trait Anxiety'.

### Statistical Procedure

Differences between groups of patients with preoperative biliary, dyspeptic or a combination of these symptoms were calculated using Chi-square tests for dichotomous and ordinal variables and one-way ANOVA between subjects

for continuous variables. Friedman's tests were used to calculate an overall difference in symptom report between the preoperative measurement and the measurement and 6 months. Changes in symptom report over a 6-month time were obtained using Wilcoxon's signed-rank tests (for ordinal variables) and McNemar's tests (for dichotomous variables). Significance was obtained from Chi-square tests and, if necessary, Binominal tests.

Persistence and emergence rates were obtained for 'any symptom'. Persistence was defined as patients reporting the same symptom preoperatively and at 6 months. An overall score was calculated from biliary, dyspeptic, and biliary/dyspeptic symptoms. Emergence was defined as patients who did not report a specific symptom preoperatively, but who reported the symptom at 6 months. Again an overall score was obtained for biliary, dyspeptic, and biliary/dyspeptic symptoms.

Univariate logistic and multinomial regression analyses, taking 'symptom free' as reference group, were performed to identify predictors of postoperative symptoms at 6 months. These analyses were used for dichotomous and categorial outcomes, respectively. Significant predictors were selected and inserted in multivariate logistic or multinomial regression analysis (Backward procedure, Method Likelihood Ratio) to identify independent predictors of postoperative symptom report. In multinomial regression analysis, the

reference category was 'symptom free'. A  $p$  value  $< .05$  indicated statistical significance. Statistical analyses were performed using SPSS version 16.0.

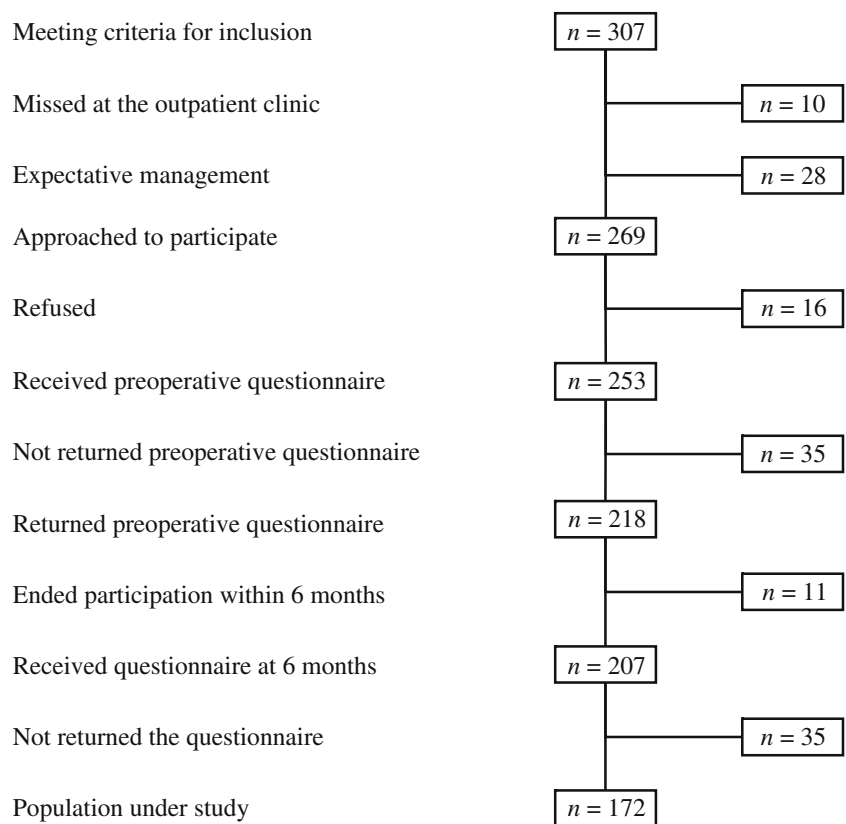
**Results**

A flow-chart of the population under study is shown in Fig. 1. In total, 253 patients received the first set of questionnaires, of which 172 patients returned their questionnaires at 6 months after cholecystectomy (response rate 68.0%). Clinical and demographic patient characteristics are shown in Table 1. The majority of patients (61.9%) reported both biliary and dyspeptic symptoms (Table 2). Moreover, 24.5% of the patients only reported biliary symptoms, and 13.6% of the patients only reported dyspeptic symptoms. In this study, groups of patients were based on the report of preoperative biliary symptoms (group 1), dyspeptic symptoms (group 2) or both (group 3). These groups did not differ on any clinical or demographic characteristics.

**Six Months Benefit of Cholecystectomy**

At 6 months after the operation, the majority of patients had started their normal daily activities (95.5%). Of the patients who had paid work ( $n=117$ ), 99.1% had returned

**Fig. 1** Flow-chart of the population.



**Table 1** Demographic and Clinical Characteristics ( $n=172$ )

Demographic characteristics	
Female patients (%)	76.2
Age (M $\pm$ SD)	47.51 $\pm$ 11.33
Highest level of education	
Lower or vocational education (%)	17.1
Secondary education (%)	49.4
Higher education (%)	6.4
Higher professional education or university (%)	27.1
Working under payment (%)	68.8
Marital status	
Single (%)	4.1
Widowed or divorced (%)	5.9
Married or cohabitant (%)	90.0
Medical characteristics	
Self-reported medication use	
Analgetics (%)	36.8
Psychotropic medication (%)	9.9
Other medication (%)	49.7
Comorbidities	
Coronary arterial disease (%)	18.0
Pneumonol disease (%)	5.8
Abdominal disease (%)	22.1
Kidney disease (%)	0.6
Urogenital disease (%)	8.1
Neurological disease (%)	9.9
Other comorbidities (%)	43.6
High trait anxiety (HTA) STAI-Trait $\geq$ P 80 (%)	20.1

to work, whereas 0.9% of the patients had not returned to work.

Six months after cholecystectomy, 47.8% of the patients were free of symptoms (see Fig. 2), whereas persistence and emergence of any symptom was reported by 17.9% and 34.0% the patients, respectively. At 6 months, a substantial group of patients still reported specific postoperative health complaints, such as wound pain (7.2%), shoulder pain (10.1%) and pain in the upper right abdomen (13.7%) at follow-up. Over 6 months time, the number of patients with biliary symptoms only and a combination of biliary and dyspeptic symptoms decreased from 24.5% to 3.1% and from 61.9% to 14.3%, respectively. However, the number of patients that reported dyspeptic symptoms increased from 13.6% preoperatively to 34.8% at 6 months postoperatively (see Fig. 2).

Patient groups were compared with regard to postoperative symptomatic outcome at six months. The overall symptomatic outcome of patients in group 2 differed significantly from the outcome of the other patient groups ( $\chi^2=8.30$ ,  $p=.040$ ). The three patient groups differed significantly regarding the report of any postoperative

**Table 2** Preoperative Presentation of Cholelithiasis

Preoperative symptom report	
Upper abdominal pain (%)	66.5
Nausea (%)	40.4
Vomiting (%)	56.1
Bad taste (%)	21.6
Heartburn (%)	27.5
Under abdominal pain (%)	20.5
Diarrhoea (%)	18.7
Flatulence (%)	36.8
Biliary symptoms <sup>a</sup> only (%)	24.5
Dyspeptic symptoms <sup>b</sup> only (%)	13.6
Biliary <sup>a</sup> and dyspeptic <sup>b</sup> symptoms (%)	61.9
Demonstrated stones or sludge (%)	91.9
Preoperative biliary attacks (M $\pm$ SD)	5.2 $\pm$ 7.2
Pain during biliary attacks	
Pain in rest and movement (%)	94.3
Pain only in rest (%)	4.5
Pain only in movement (%)	1.2
Non-specific symptoms <sup>c</sup> (%)	56.1

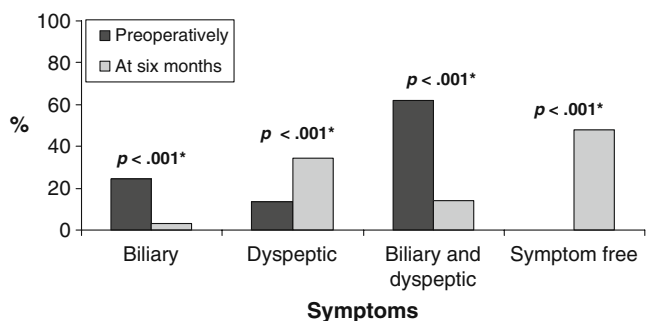
<sup>a</sup>Biliary symptoms, one or more of the following symptoms: upper abdominal pain, nausea and vomiting

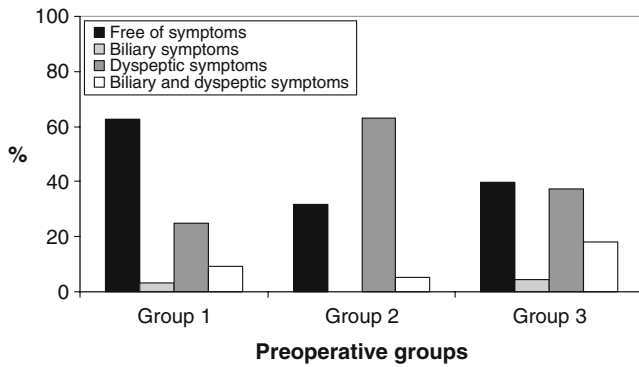
<sup>b</sup>Dyspeptic symptoms, one or more of the following symptoms: bad taste, heartburn, under abdominal pain, diarrhoea and flatulence

<sup>c</sup>Non-specific symptoms, one or more of the following symptoms: general malaise (9.4%), fatigue (49.7%), weight change (2.9%), decreased sexual functioning (10.5%) and other health complaints (12.3%)

symptom (biliary or dyspeptic) ( $\chi^2=6.29$ ,  $p=.043$ ). At 6 months, postoperative symptoms were reported by 68.4% of the patients in group 2, whereas postoperative symptoms were reported by 37.5% and 60.2% of the patients in group 1 and 3, respectively. Group 3 ( $n=53$ ) differed significantly from the other two groups.

Furthermore, the groups differed significantly with respect to the persistence of the same pattern of preoper-

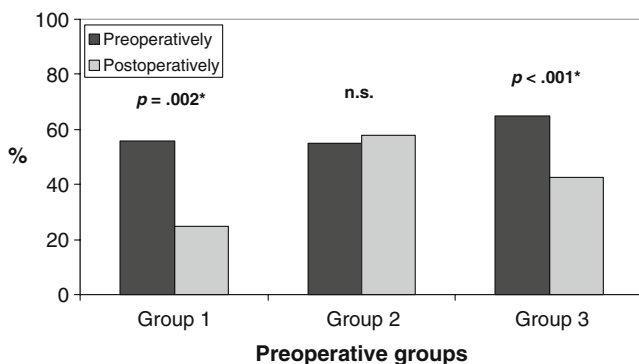
**Fig. 2** Report of symptoms preoperatively and at 6 months post-cholecystectomy.



**Fig. 3** Report of symptoms at 6 months after cholecystectomy.

ative symptoms ( $\chi^2=25.02, p<.001$ ). Preexisting symptoms persisted most often in group 2 (63.2%), followed by patients in group 3 and group 1 (18.2% and 3.1% of the patients, respectively). Furthermore, preoperative groups differed significantly regarding the development of new symptoms postoperatively ( $\chi^2=11.64, p=.003$ ). Patients in group 2 less often developed new symptoms after cholecystectomy than patient in the other groups (5.3% vs. 37.8% ( $\chi^2=6.52, p=.011$ )). Patients in group 3 developed symptoms of another category more often than patients in the other groups (42.0% vs. 24.3% ( $\chi^2=4.87, p=.027$ )). In fact, 4.5% and 37.5% of all patients in group 3, reported only postoperative biliary or only postoperative dyspeptic symptoms, respectively, which implicates that preoperative biliary symptoms subsided more often. Preoperative groups did not differ with regard to the report of postoperative non-specific symptoms.

Fig. 3 gives an overview of postoperative symptoms at 6 months for each group. Within each group, the number of patients with the prominent preoperative symptom decreased. In group 1, a significant number of patients developed a different pattern of complaints with dyspeptic symptoms only ( $p=.005$ ). Furthermore, over 6 months time, the number of patients with non-specific symptoms decreased within group 1 ( $p=.002$ ) (Fig. 4). In contrast, in



**Fig. 4** Report of non-specific symptoms over 6 months time.

group 2 the number of patients with non-specific symptoms did not decrease. In group 3, a decrease of patients with non-specific symptoms ( $p<.001$ ) and a change to individual biliary ( $p=.046$ ) or dyspeptic symptoms ( $p<.001$ ) was observed at 6 months.

**Predictors of 6 Months Outcome**

Univariate logistic regression analyses were performed to identify predictors of the report of (any) symptoms at 6 months. These results are shown in Table 3. Multivariate regression analyses demonstrated that the postoperative report of biliary and/or dyspeptic symptoms was predicted by preoperative non-specific symptoms only (OR=3.06,  $p=.003$ ; 95% CI: 1.46–6.42). When groups of patients were investigated separately, preoperative non-specific symptoms were the only predictor of any postoperative symptom in group 1 (OR=6.11,  $p=.043$ ; 95% CI: 1.06–35.35) and group 2 (OR=4.53,  $p=.002$ ; 95% CI: 1.77–11.60). No predictors were identified for the report of any postoperative symptom in group 3.

Predictors of persistence of existing symptoms were investigated by univariate logistic regression analyses (see Table 4). Multivariate logistic regression analysis demonstrated that the use of psychotropic medication (OR=5.27,  $p=.010$ ; 95% CI: 1.50–18.55) and the preoperative report of dyspeptic symptoms only (OR=16.69,  $p<.001$ ; 95% CI: 4.59–60.68) were independent predictors of persisting symptoms. Univariate and multivariate multinomial regression analyses were performed to identify predictors of postoperative biliary symptoms, dyspeptic symptoms and a combination of biliary and dyspeptic symptoms. Results of univariate regression analyses are shown in Table 5. Entering these predictors simultaneously in a multivariate multinomial regression analysis demonstrated that postoperative biliary symptoms were predicted by HTA only, whereas postoperative dyspeptic symptoms were independently predicted by preoperative dyspeptic and non-specific symptoms. Non-specific symptoms and the use of psychotropic medication predicted a postoperative course with both biliary and dyspeptic symptoms (see Table 6).

**Discussion**

The results of cholecystectomy are disappointing for many patients. Currently, the indication of an elective cholecystectomy is such that many patients are operated without critical consideration of individual expectations and risks. At 6 months after cholecystectomy, merely 47.8% of the patients were symptom free. In addition, 17.9% and 34.0% of the patients reported persistence and emergence of new symptoms, respectively. As it concerns a substantial number



**Table 3** Univariate Predictors of Symptom Report at 6 Months after Cholecystectomy

Preoperative characteristic	OR	95% CI	p value
Psychotropic medication	3.44	1.07–11.04	.038*
Non-specific symptoms	2.85	1.49–5.45	.002*
Combination of biliary and dyspeptic symptoms	2.10	1.12–3.94	.021*
HTA	2.89	1.23–6.79	.015*
Neurologic comorbidity	4.17	1.13–15.38	.032*

Significant results are reported only

\* $p < .050$  indicated significance

of patients, preoperative recognition of patients with an increased risk of negative outcome is essential to optimise the management of cholelithiasis. The present study demonstrated that patients with preoperative dyspeptic symptoms and patients using psychotropic medication are both at risk of persistence of the preexisting pattern of health complaints after cholecystectomy. Furthermore, patients with non-specific symptoms and patients using psychotropic medication are at risk of the experience of biliary and/or dyspeptic symptoms at 6 months. Patients with High Trait Anxiety (HTA) have a ten times greater chance to experience specifically postoperative biliary symptoms.

The current study investigated 6-months outcomes, as the greatest improvement after cholecystectomy is seen within this time period.<sup>25</sup> Overall, comparability of studies focussing at approximately 6 months is limited,<sup>10,13,15,26</sup> because of differences in criteria for inclusion, designs, classification, definition and operationalisation of outcomes and variability in moments of follow-up. The percentage of patients who are free of symptoms or report persisting symptoms is comparable to results of other studies focussing at 6 months.<sup>10,13,15</sup> The percentage of patients developing new symptoms (34.0%) is higher than percentages found in other studies (1.7–24.5%),<sup>10,13,15,26</sup> which may be attributed to patients in group 3 who recover partially and report only biliary or dyspeptic symptoms after cholecystectomy.

In the current study, dyspeptic symptoms persisted more often than biliary symptoms, which is in line with other

studies focussing at 6 months after cholecystectomy.<sup>13,26</sup> Differentiating between patient groups showed that patients with only dyspeptic symptoms have the worst prognosis: dyspeptic symptoms often tended to persist (63.2%) over 6 months time. Furthermore, in patients with a combined symptom profile dyspeptic symptoms tend to persist<sup>15</sup> and dyspeptic symptoms developed in 25% of the patients with preoperative biliary symptoms. The latter findings support a shift towards dyspeptic symptomatology at 6 months, as mentioned in previous studies.<sup>13,15</sup> Reasons for this shift may be related to preexistent gastrointestinal symptoms,<sup>26</sup> postoperative changes in duodenogastric reflux,<sup>26</sup> retained stones or the formation of new gallstones,<sup>27</sup> or psychological variables such as HTA.

We found that patients with preoperative non-specific symptoms are also at risk for any postoperative dyspeptic or combined dyspeptic and biliary symptoms. The cause of these non-specific symptoms is unclear; these symptoms may coincide with biliary, dyspeptic or other health symptoms, comorbid conditions or may contain a more subjective component, influenced by psychological variables, such as depressive symptomatology or personality. Weinert et al.<sup>13</sup> demonstrated that a subjective measure, namely self-rated preoperative health status (SF 36), predicts outcomes at 6 months after cholecystectomy. However, the SF-36 consists of items such as bodily pain which could be directly related to biliary and dyspeptic symptoms. Therefore, we believe that a parsimonious list of non-specific symptoms may be more precise and better differentiates general symptoms from pure

**Table 4** Univariate Predictors of Category of Postoperative Symptoms

Postoperative outcome	Preoperative predictor	OR	95% CI	p value
Persistence of preoperative symptoms	Dyspeptic symptoms only	12.71	4.40–36.70	<.001*
	HTA	2.89	1.16–7.18	.023*
	Number of non-specific symptoms	1.50	1.02–2.20	.041*
	Psychotropic medication	5.51	1.90–15.96	.002*
	Abdominal comorbidity	2.78	1.16–6.63	.022*

Significant results are reported only

\* $p < .050$  indicated significance

**Table 5** Univariate Predictors of Category of Postoperative Symptoms

Postoperative outcome	Preoperative predictor	OR	95% CI	<i>p</i> Value
Biliary symptoms only	HTA	12.19	1.76–84.30	.011*
Dyspeptic symptoms only	Dyspeptic symptoms only	3.23	1.13–9.22	.029*
	Neurologic comorbidity	4.72	1.22–18.35	.025*
	Non-specific symptoms	2.11	1.04–4.26	.038*
Biliary and dyspeptic symptoms	Psychotropic medication	9.73	2.59–36.53	.001*
	HTA	5.00	1.59–15.74	.006*
	Biliary and dyspeptic symptoms	2.74	1.01–7.42	.047*
	Non-specific symptoms	8.01	2.19–29.33	.002*

Significant results are reported only

\**p*<.050 indicated significance

biliary and dyspeptic symptoms. Although preliminary results suggest that patients with non-specific symptoms are at risk of negative postcholecystectomy outcomes, further research needs to corroborate this finding and to address the issue of subjectivity.

As persistent biliary symptoms are decisive for the subjective perception of an unsuccessful procedure,<sup>13</sup> special attention needs to be paid to patients with HTA, who are at risk to report persisting biliary symptoms at 6 months postcholecystectomy. So far, HTA has been identified as a possible predictor of short-term postcholecystectomy outcomes.<sup>19,28</sup> Patients with HTA are predisposed to react with heightened anxiety to threatening situations,<sup>29</sup> and may misinterpret a broad range of gastrointestinal symptoms as being of biliary nature. Misinterpretations may be mediated by the fact that HTA patients have higher pain sensitivity<sup>30</sup> and experience gastrointestinal symptoms more often than other patients.<sup>31</sup> Otherwise, because of these characteristics, HTA patients may be misdiagnosed as suffering from cholelithiasis and abusively be subjected to cholecystectomy. Consequently these patients will report persistence of preexisting symptoms. Possibly, psychosomatic mechanisms typically for HTA patients, such as heightened activity of the sympathetic nervous system,<sup>32</sup> production of higher levels of noradrenaline,<sup>33</sup> may influence digestion, wound healing or other bodily processes, which could be related to the experience of biliary-type colics after removal of the gallbladder. The role of HTA on long-term postcholecystectomy outcomes and underlying mechanisms should be further corroborated in future research.

The present study has several strengths, such as the prospective design and the participation of consecutive patients, which prevents a selection bias. In contrast to other studies,<sup>10,13,15,26</sup> we used strict criteria for inclusion of patients, such as symptomatic cholelithiasis, ASA I and II, limited age differences, indicated for elective cholecystectomy only, and used a big sample size (*n*=172). Follow-up was limited to the period of 6 to 9 months postoperatively. This gives a homogenous sample, which enables strong conclusions which are applicable to the field of action where critical consideration matters most: elective surgery. Another advantage of the study is the fact that the clinical presentation of preoperative symptoms was used as a basis for further investigation of predictors, which enlarges the specificity of the predictors and enables the clinical application of the results. The fact that we dichotomised many variables (yes/no) enhances the convenience to apply our findings directly in surgical practice. Alternatively, it entails the risk over oversimplification of our conclusions.

Other limitations of the study are the fact that we used a self-constructed symptom checklist, instead of a standardised gastrointestinal questionnaire. We found it legitimate to use such a checklist, because we carefully based our symptom checklist on information from focus groups,<sup>22</sup> other symptom checklists, and clinical experience, and currently no disease specific symptom checklist exists for cholelithiasis. The fact that we used broad symptom categories, according to a leading article of Weinert et al.,<sup>13</sup> increased the comparability to this study in particular. However, as categorising symptoms into

**Table 6** Independent Predictors of Postoperative Symptoms (Based on Multivariate Multinomial Regression Analyses)

Postoperative symptoms	Preoperative predictor	OR	95% CI	<i>p</i> Value
Biliary symptoms	HTA	10.64	1.24–90.96	.031*
	Dyspeptic symptoms only	5.69	1.50–21.63	.011*
Dyspeptic symptoms	Non-specific symptoms	2.50	1.10–5.64	.028*
	Non-specific symptoms	9.53	1.86–48.92	.007*
Biliary and dyspeptic symptoms	Non-specific symptoms	8.01	1.75–36.75	.007*
	Use of psychotropic medication	8.01	1.75–36.75	.007*

Significant results are reported only

\**p*<.050 indicated significance

biliary or dyspeptic symptoms is highly arbitrarily, comparability with other studies might be hampered. Given the ambiguous clinical presentation of cholelithiasis and the vague diagnostic criteria, classification of symptoms as being purely biliary or dyspeptic in nature seems to be extremely difficult. Furthermore, it should be noted that symptomatic outcome is not equivalent to broad outcome measures such as health status or quality of life, which can be easily assessed by standardised questionnaires. We recommend that future studies should investigate postcholecystectomy quality of life, especially in relation to symptomatic outcome and psychological predictors. Moreover, this study has the disadvantage that we have two separate measures, at baseline and at follow-up at 6 months. Therefore the study does not differentiate between the persistence of symptoms and the development of symptoms after initial disappearance after cholecystectomy. Comparing findings shortly after cholecystectomy (e.g. 6 weeks) with findings at 6 months may convey the course of symptoms over time. Furthermore, in the current study we did not control for confounding postoperative variables, such as comorbid diseases and major life events. Therefore, results at 6 months may be influenced by other factors than the recovery after cholecystectomy.

## Implications

The results of the present study may have implications for the management of symptomatic cholelithiasis. Surgeons must be aware that less than half of their patients are free of symptoms at 6 months after cholecystectomy. Therefore, patients should be informed about the considerable risk of persistent and developing symptoms at 6 months. Generally, cholecystectomy is used to prevent further episodes of biliary colics and complications,<sup>8</sup> whereas expectative management is often disregarded. The use of ursodeoxycholic acids (in combination with lithotripsy) remains a matter of debate.<sup>34</sup> If treated expectatively, the risk of complications such as acute cholecystitis, acute pancreatitis, or biliary duct obstruction is small (1–2% a year)<sup>35,36</sup> and biliary pain recurs only in 31% of the patients with previous biliary attacks >1 year.<sup>37</sup> Most interesting is that the rate of complications, improvements of quality of life, and reduced pain over a period of 5 years are equal for expectative management and cholecystectomy. Starting expectatively, only 23–49% of the patients underwent cholecystectomy because of recurred pain and complications within 2.5–5 years.<sup>25,38</sup> As expectative management is safe and offers good perspectives, it should be preferred as treatment to start with in cholelithiasis especially in patients with a high risk of postoperative symptoms.

Recognition of high-risk patients is crucial to gear the treatment to the patient's characteristics. In patients with classical biliary symptoms (alone or together with dyspeptic symptoms), surgeons should be attentive to non-specific symptoms during anamnesis. In patients using psychotropic medication and patients reporting dyspeptic symptoms only, wait-and-see should be considered as the treatment of choice. Limiting our recommendations to the persistence of biliary symptoms, which are most indicative of an unsuccessful procedure, patients with HTA should be informed about their heightened risk. Furthermore, in HTA patients, the biliary or dyspeptic nature of preoperative symptoms should be addressed carefully. Expectative management should be considered especially in HTA patients with dyspeptic symptoms or using psychotropic medication. Alternatively, psychotherapeutic interventions stemming from cognitive behavioural therapy or mindfulness may teach patients how to deal with anxiety provoking situations and may reduce stress in HTA patients. Consequently, the negative influence of HTA may be reduced and postoperative symptomatic outcomes may be improved. Summarised, in cholelithiasis, surgeons should offer patients a treatment which is based on individual risks and expectations. Hopefully, the rate of unsuccessful treatments will be reduced, which will lead to greater cost-efficiency in health care.

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